JUNE 13, 1958

electronics

business edition

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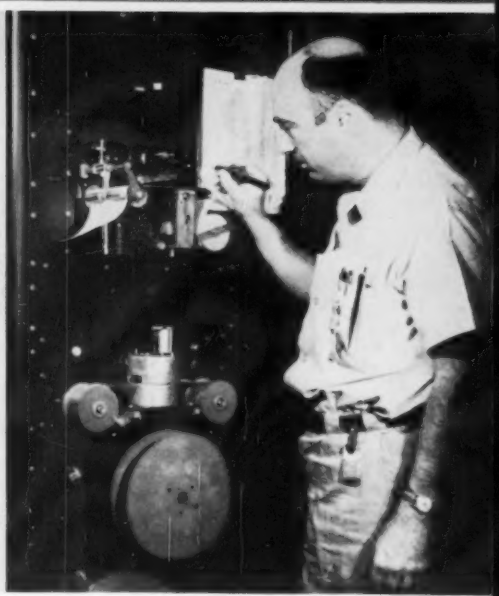
On Guard Against A-Bomb Fallout

Counters and computers keep tabs on radiation from Pacific tests . . . . . p 13



Police Use Sparks Microwave Sales

Growing market keeps pace with spreading highway systems . . . . . p 18

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Shoptalk . . .

ARE A-BOMB TESTS A HAZARD? A new series of atomic explosions is now wracking Eniwetok Proving Grounds in the Pacific. During this series of tests, new nuclear weapons for aircraft and missile defense will be tried out.

Monitoring radioactivity produced by the bombs is doubly important in this series. The bombs must be "clean" because radioactive fallout would likely descend on friendly heads. In addition, there is worldwide concern about possible health hazards of nuclear testing.

Recently, AEC issued a summary of the radiological program associated with the tests. Associate Editor Sideris then dug for additional information telling of the vital job given electronic equipment in this program. For his report, see p 13.

ELECTRONICS IN OUR NUCLEAR NAVY. Recent launching of the nuclear submarine *Skipjack*, keel-laying of the nuclear merchant ship *Savannah* and work on other submarines and surface craft in various phases of development point to new markets for reactor controls, more elaborate navigation systems and other electronic equipment.

Navigation systems like SINS, computer systems like Navdac, bigger and better sonar gear, launching controls for the Polaris missile and its descendants, all form part of the electronic complex planned for nuclear submarines like Nautilus, Seawolf and Skipjack.

To get a heft of the part electronics will play in the nuclear Navy, Associate Editor Leary went to the *Skipjack* launching, talked to engineers at General Dynamics' Electric Boat division, checked with Office of Naval Research and other Navy bureaus. His story begins on p 15.

QUIET BOOM IN POLICE RADIO. Checks with equipment maufacturers show that state and municipal governments are becoming increasingly important as customers for microwave and mobile radio equipment.

Associate Editor Emma's rundown on new developments in the mobile and microwave radio markets shows how new highway building adds to business. See p 18.

MORE PAY FOR R&D. Speed at which technology obsoletes military equipment today has led to shorter production runs, smaller fixed-price production contracts, more R&D contracts at low-profit cost-plus-fixed-fee rates.

Manufacturers assert profit margin allowed on cost-plus work must be raised from customary seven percent now allowed or manucapital. There are some signs that rates may be raised on hard-to-do R&D contracts.

Associate Editor De Jongh talked with electronics and missile manufacturers, government procurement officials and financial leaders to get the story on what businessmen need and what the government is likely to do for them. See p 17.

Coming in our June 20 issue . . .

Coming in Our June 20 Issue . . .

● **Improved Photoelectric System.** Easily obscured light beams and lamps that require power supplies are two important shortcomings of standard photoelectric systems. Paul Weisman of Westinghouse sidesteps these problems by using a radioisotope source to furnish high-energy radiation and a solid-state photocell to detect the radiation.

Interruption of high-energy beam changes resistance of cadmium-sulphide detector. Transistor amplifier converts variations into signals capable of actuating limit switches and positional devices. System is uneffected by most environmental conditions, is small, inexpensive and reliable. Source-detector separation cannot, however, exceed two in.

● **Ultrasonic Flaw Detector.** Internal flaws in materials can be observed with ultrasonic pulses in a system developed by J. D. Ross and R. W. Leep of E. I. du Pont de Nemours. As a test piece is scanned by the tester, defects produce pulses which can be counted or mapped on electrosensitive paper. Coupling is achieved by submerging both the test piece and the transducers in water.

● **Over-Current Protection.** Protecting transistors from over-current conditions has long been the electronic designer's headache. Especially in power supplies, subjected to increased, shorted or capacitive loads, has this been a pressing problem. Now, however, H. D. Ervin of Magnovax has designed a current-limiting characteristic protection circuit that operates statically, without need for resetting.

Although designed specifically for a power-supply, the circuit is applicable to other circuits that are vulnerable to excessive currents. Present application provides instantaneous response when power supply is shorted or when the regulator transistor is overloaded.

● **Jammer Nomograph.** A radar jamming nomograph for free space that determines susceptibility of radar to noise jamming rather than the effectiveness of the jamming is discussed by George Minty of the Engineering Research Institute of the University of Michigan. Minty's nomograph is based on the principle that noise jamming increases the receiver's inherent noise and thereby reduces the maximum radar detection range.

● **Mobile Microwave.** Mobile microwave relay system with separate visual and aural transmitters feeds combined double-carrier signal to a common antenna. Authors T. G. Custin and J. Smith of General Electric point out that signal is amplified and demodulated at the receiving end in much the same manner as in tv broadcasting.

A modulated klystron is locked to crystal reference oscillator by afc. Calibrated wave-trap modifies the saw-tooth afc waveshape for internal frequency monitoring. Diplexer in receiver is similar to that for transmission and enables balanced mixing of composite signal.

electronics business edition

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OIL Resistance	Slight Swelling	Slight Swelling	Slight Swelling	Slight Swelling	Excellent	Excellent	Excellent
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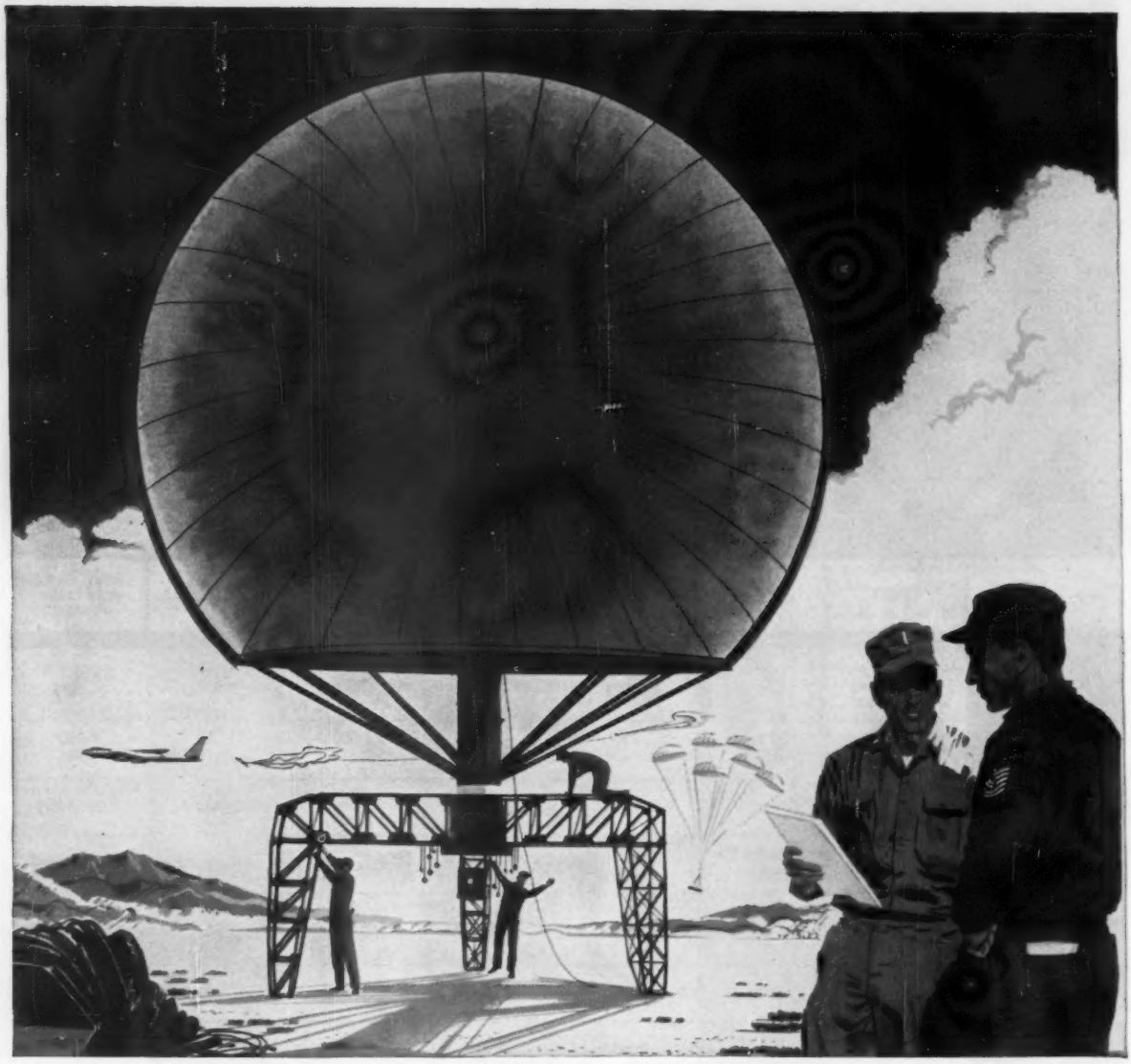


Have Radar—Will Travel

"Paraballoon" antenna folds up, flies to the fight. It's magnesium light.

Take a high-powered radar installation, and design it with magnesium so it can be assembled and disassembled easily, and toted around from place to place.

That's just what Westinghouse did when it developed the "Paraballoon" antenna for the Air Force. This highly mobile radar unit weighs just 1,730 lbs. compared to 10,000 lbs. for its comparable heavy metal counterpart. It can be taken apart by its crew in minutes, packed in 200-lb. containers, airlifted to a new location and put into action immediately.

Wondering why the "Paraballoon" antenna can do such a big job, yet weigh so little? The unit is constructed almost entirely of lightweight, rugged magnesium alloy. The reflector platform is magnesium sheet and extruded channels. The turning tube is a magnesium sand casting and the tripod is welded magnesium tubing. The radar reflector is a fully deflatable fiber glass balloon.

The "Paraballoon" antenna is one of the many examples of how the high strength-to-weight ratio of magnesium pays off in terms of saved weight in electronic equipment. For more information on magnesium in electronics contact the nearest Dow Sales Office or write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Department MA 1416N-1.

YOU CAN DEPEND ON DOW

Fewer Bankruptcies

Number of electronics manufacturers in financial difficulties drops more than 20 percent in 11 months

NUMBER OF ELECTRONIC equipment and parts manufacturers who went into bankruptcy or the hands of creditors committees decreased more than 20 percent during the 11 months ending March 31, in comparison to a year ago. So said T. B. Judge, chairman of the EIA credit committee and credit manager of International Resistance Co. of Philadelphia, at the EIA convention in Chicago.

Judge pointed out that the number of electronics companies in financial difficulties during the 1958 credit period was at the lowest point in four years. Some 27 electronics manufacturers were in financial difficulties during the period. This compares with 34 in 1957, 29 in 1956 and 26 in 1955.

Study of manufacturers involved shows a sharp drop in number of component manufacturers, practically no concerns in financial difficulties in the phonograph-high-fidelity field and an increase among test instrument and communication equipment manufacturers.

Number of component manufacturers in money trouble dropped from 14 in 1956 to 8 in 1957. However, number of test instrument and communication equipment firms in difficulty jumped from five to 10.

EIA Enjoys $ Surplus

ELECTRONIC INDUSTRIES ASSOCIATION members were told the association should complete the year with a substantial surplus. The good news comes from Leslie F. Muter, association treasurer and president of the Muter Company of Chicago.

Present fiscal budget adopted in June of 1957 was based on an estimated income of $785,000 and expenses of $728,000, Muter said in his report. This budget, which anticipated a reasonable surplus, was increased by $18,220 during the year for dues rebates, international department, tv allocation organization study and name change expenses.

Income based on the Jan. 31, 1958, audit totaled $803,200 from 492 members in six membership divisions.

SHARES and PRICES

ULTRASONIC equipment manufacturers have only begun to tap their sales future. Sales in 1957, excluding military ultrasonics, were about $25 million. Ten years from now annual sales will hit $1 billion, some manufacturers say.

Here's the sales record of one manufacturer specializing in ultrasonics. Sales multiplied 10 times in 1956, its second full year of operation, tripled in 1957 and are expected to triple again in 1958.

Big future expectations have attracted many firms to this field. The 14 publicly owned firms listed below represent only about one-fifth of the total number of manufacturers. Moreover, the field is currently a center of interest for mergers and acquisitions.

Ultrasonics makes practical use of high frequency sound applications, above the audible range. Some commercial and industrial uses of ultrasonic equipment: cleaning, drilling, grinding, soldering, welding, scale inhibition, burglar alarms. Equipment is also used in communications, process control, for nondestructive testing. In medicine, it is used for instrument cleaning, surgery, dental drilling.

Typical Ultrasonic Equipment Manufacturers	Recent Price	Indicated Dividend Rate	Percent Yield	Earned Per Common Share 1958	Period	1957	Traded	1958 Price Range
Acoustica Associates	6	....	...	0.08	(year)[5]	d-0.10	OTC	3¾–6
Bendix Aviation	48⅜	2.40	5.3	0.97	(6 mos)[4]	3.63	NYSE	44½–53
Bogue Electric	1⅜[1]	....	...	0.13	(6 mos)[3]	d-0.21	OTC	.....
Clevite (Brush Electronics)	16⅜	1.00	6.0	0.28	(3 mos)	0.88	NYSE	15¾–18⅜
Curtiss Wright	23¾	....	...	0.62	(3 mos)	1.30	NYSE	20⅝–28⅛
Fischer and Porter	11⅛[1]	0.20[2]	1.8	0.63E	(year)[6]	1.62	OTC	10 –12
General Electric	58¾	2.00	3.4	0.56	(3 mos)	0.73	NYSE	57 –64¼
Globe Union (Centralab)	15½	0.80	5.2	1.62	(year)[7]	1.42	ASE	14⅝–17¼
Kidde (Walter) & Co.	11¼	0.60	5.3	1.57	(year)[7]	2.38	ASE	11 –13
Laboratory for Electronics	9½[1]	....	...	N.A.	(year)[6]	0.21	OTC	3¾– 9¾
Maxson W. L.	5⅜[1]	0.05	0.1	0.03	(6 mos)[4]	0.17	OTC	4⅜– 6½
Narda	2¾[1]	0.10	3.6	0.02	(6 mos)[7]	d-0.016	OTC	2½– 3½
Raytheon	26½	[3]	...	0.58	(3 mos)	0.40	NYSE	21½–27¼
Westinghouse Electric	58¼	2.00	3.4	0.73	(3 mos)	0.82	NYSE	57¼–65½

d-deficit E—estimate N.A.—not available

[1] bid [2] plus stock [3] stock [4] ending Mar. 31 [5] ending Aug. 28 [6] ending in April

[7] ending Dec. 31 [8] ending Feb. 28

MERGERS, ACQUISITIONS and FINANCE

• **Litton Industries,** diversified electronics firm of Beverly Hills, Calif., plans to purchase **Westrex Corp.,** a wholly owned subsidiary of **Western Electric.** Purchase price was not disclosed. It is expected purchase will be completed by August 15th, after agreement on patent license and continuation of Westrex' present employee benefit plan has been worked out. Purchase brings Litton an international marketing organization with 1,300 employees in 35 countries. Westrex distributes and services abroad a line of communications products, including Teletype and equipment for the motion picture industry. In the U. S. it distributes and services sound recording equipment for the motion picture and phonograph record industries. Westrex' gross income in 1957 was over $13 million.

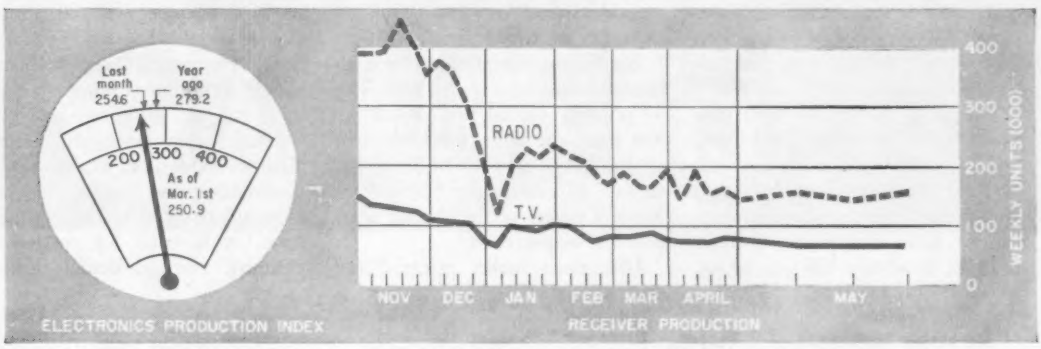
• **ITEK Corporation,** Boston information processing engineering research firm, merges with **Vectron, Inc.,** manufacturer of electronic and electromechanical equipment. ITEK is the surviving corporation but business activities will be concentrated in Vectron's plant in Waltham, Mass. Annual sales of $5 million have been estimated for the combined operation. ITEK recently acquired **Physical Research Laboratories of Boston University,** which was working in military fields of optics, photography and reconnaissance.

• **U. S. Chemical Milling** of Manhattan Beach, Calif., purchases all assets of **Foto-Etch Circuits** of Los Angeles. Foto-Etch designs and produces printed circuits used by the electronics industry. USCM's plant facilities will be used to mass produce printed circuits in unlimited sizes. Its research facilities will attempt to expand potential applications of printed circuits.

• **IT&T** completes sales of $28,692,000 of 4⅞ percent convertible debentures due in 1983. The issue was 95.36 percent subscribed through exercise of rights issued to company stockholders. Kuhn, Loeb & Co. of New York City headed underwriters.

• **Acoustica Associates,** ultrasonic equipment manufacturer of Glenwood Landing, N. Y., expects sales of about $3 million and substantially higher earnings in its current fiscal year, ending Feb. 28, 1959. Firm earned 10¢ per share on sales of $1,097,000 in the year ending last February.

DIVIDENDS: **American Bosch Arma** declares regular 30¢ quarterly on common stock, payable July 15, and $1.25 on 5 percent cumulative preferred, payable July 1; **Garrett Corp.,** 5 percent stock dividend, payable June 30, in addition to regular 50¢ quarterly cash dividend, payable June 30; **Sylvania Electric,** regular 50¢ quarterly on common and regular $1.00 quarterly on preferred, both payable July.



FIGURES OF THE WEEK

RECEIVER PRODUCTION

(Source: EIA)	May 23, '58	May 16, '58	May 24, '57
Television sets, total	73,468	67,949	86,629
Radio sets, total	161,882	149,659	249,720
Auto sets	52,119	45,582	93,275

STOCK PRICE AVERAGES

(Source: Standard & Poor's)	May 28, '58	May 21, '58	May 29, '57
Radio-tv & electronics	47.79	46.22	51.58
Radio broadcasters	62.43	62.56	68.64

FIGURES OF THE YEAR

Totals for first two months

	1958	1957	Percent Change
Receiving tube sales	56,466,000	82,031,000	−31.2
Transistor production	6,061,955	3,221,000	+88.2
Cathode-ray tube sales	1,178,046	1,489,223	− 2.1
Television set production	804,396	914,887	−12.1
Radio set production	1,903,418	2,350,294	−19.0

LATEST MONTHLY FIGURES

EMPLOYMENT AND EARNINGS

(Source: Bur. Labor Statistics)	Feb. '58	Jan. '58	Feb. '57
Prod. workers, comm. equip.	349,800	362,000	394,600
Av. wkly. earnings, comm.	$79.75	$79.15	$80.18
Av. wkly. earnings, radio	$78.98	$77.40	$76.80
Av. wkly. hours, comm.	38.9	38.8	40.7
Av. wkly. hours, radio	39.1	38.7	40.0

TRANSISTOR SALES

(Source: EIA)	Feb. '58	Jan. '58	Feb. '57
Unit sales	3,106,708	2,955,247	1,785,000
Value	$6,806,562	$6,704,383	$5,172,000

TUBE SALES

(Source: EIA)	Feb. '58	Jan. '58	Feb. '57
Receiving tubes, units	29,661,000	26,805,000	44,460,000
Receiving tubes, value	$25,650,000	$23,264,000	$36,631,000
Picture tubes, units	556,136	621,910	728,363
Picture tubes, value	$11,210,527	$12,341,927	$13,134,778

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(2) Adoption of, as standard, a disposable 30" x 30" two-way entry pallet, carrying 4 layers of 9 bulk cartons each, with protective steel strapping. Movement to production line or storage can be in full pallet quantities or broken into smaller units for manual handling.

Based on the new carton and palletized system, standard packing quantities for each item have been established. Write for new chart, BP-1, which defines these standard packing quantities. For your copy, address Southern Screw Company, Box 1360, Statesville, N. C.

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WASHINGTON OUTLOOK

THE PENTAGON is taking a long, hard look at the highly touted weapon-system-management scheme. Observers guess that the plan will be shaken down somewhat, that new limits will soon be clamped on the powers of prime contractors on missile or aircraft projects run under weapon-system management.

Under weapon-system management, control over a weapon development or production project is centralized in one prime contractor—with a minimum of government interference. The prime contractor has responsibility for the design and production on an entire missile or plane and all its components. He builds much of this himself, farms out some work to subcontractors, assembles the product, even directs crew training and supervises installation and maintenance.

The system was conceived as a means of simplifying and speeding development of the more complex new supersonic planes and missiles. Previously, the prime contractor's function was essentially an assembly job—putting together the engine, landing gear, armament and the like designed by other companies and furnished by the government.

Now, many Defense Dept. officials are having some second thoughts about the weapon-system scheme. They complain that the armed services have abdicated control over projects to the primes, and that as a result development costs have mushroomed. Their chief gripe: that many weapon system primes are duplicating each other's ground-support equipment and important components.

- **There is real concern** growing among defense contractors about doing business with the government. Contractors have asked Defense Secy. Neil H. McElroy for more liberal treatment in payment schedules. But, they were turned down. The situation, industry claims, is leading them into a financial crisis.

The pinch on defense contractors started last summer when the White House slapped a spending ceiling on military procurement. It brought a series of cancellations and stretchouts. The Russian sputniks brought an easing on the purse strings, but the situation is far short of what industry wants. And, there is little solace to be gained from future prospects. First step toward getting freer money from the Pentagon is generally considered to be a sizable increase in the national debt ceiling. But, observers see little chance of this happening.

It is difficult to pin down the real trouble spots. The top Pentagon officials disclaim any contract juggling or delays in bill payments. But, industry spokesmen say the pinch is real, that lower echelon officials—those actually doing the work—have asked contractors to hold back voluntarily on submitting bills. The reason is to ease some of the departments—Navy's Bureau of Aeronautics for one—over into the next fiscal year.

There is an ominous cloud over the situation, too. Defense spending for fiscal 1958 is set at $39.1 billion. Some $31.9 billion was spent during the first 10-month period, leaving $7.2 billion for the remaining two months. The monthly spending rate, however, has not been running higher than $3.2 billion. It has contractors wondering if a major retrenchment program may be in the offing.

CIRCLE 5 READERS SERVICE CARD →

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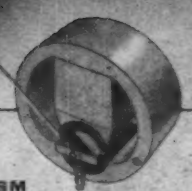

MM-5 "HI-FI"
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1. One piece pole structure broached after magnet assembly is soldered, assuring perfect alignment of pole faces.
2. Marion "Coaxial" core and yoke assembly.
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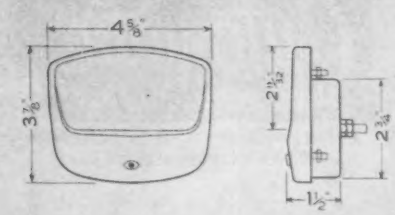

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CIRCLE 6 READERS SERVICE CARD

Eppert: the cafeteria closes

NEW Burroughs Corp. president Ray Russell Eppert used to be called "Track Four" around his Detroit home office because of his express-train speed and efficiency. All the same, the slim, dynamic executive, who will be 56 next month, manages to enjoy life: he looks ten years his own junior, is easy and relaxed in talking with people.

Born in Carbon, Ind., he went to school in Terre Haute, skipped college to go to work. He went west to Denver at 17, worked as a roustabout in the *Denver Post's* circulation department, later took a job in a bank in Rock Springs, Wyo. This job required him to operate a Burroughs adding machine; the only problem was that he didn't know how. "As a matter of fact," he admits, "I'd never heard of Burroughs."

He began night-clerking in a hotel, picked up a *Denver Post* circulation franchise on the side. At the hotel he got to know a recurrent guest named G. H. Speight who was a Burroughs salesman. Speight sold Eppert on his company. Eppert went to the nearest branch, in Ogden, U., and on April Fools Day 1921 went to work as a shipping clerk.

He later became a salesman, started the long climb to his present post. When the war broke out he was general sales manager, took over as v-p for marketing in 1946. In 1951, Eppert became exec v-p and right hand to the late John Coleman, toughminded salesman who was his predecessor as president.

Eppert looked on the postwar boom as an era of "cafeteria selling," with customers "willing to stand in line and wait." Now he figures "the customer wants to sit in the dining room, look at the menu, and make his choice carefully." He adds "hard orthodox marketing is the only thing that will get us over this bump in the road."

Eppert and his wife Helen like long motor trips in the West. "We picnic and cook along the way. No camping in tents, though." He likes golf and horseback riding, reads American history and detective stories as sauce to his heavy diet of homework and civic duties.

COMMENT

The Airways and CAA

Your airways modernization story ("What's Coming in Air Control," May 16, p 17) was most interesting and timely. It was a pleasure to see some emphasis placed on the work CAA is doing —and has been trying to do for

years—without all the fanfare for the Airways Modernization Board. After all, as you said in your story but didn't stress particularly, CAA spent $106 million in the last fiscal year and AMB only $6.5 or $7 million. Yet AMB has been getting all the publicity. . . .

AARON S. JOHNSON
INDIANAPOLIS, IND.

. . . For all the rude things that have been said about the Department of Commerce, they've certainly pushed technology forward . . .

A. T. WORLEY
ATLANTA, GA.

Apropos of CAA, we got a note recently from one of our friends in the Administrator's office that read, in part:

The nation will be celebrating Civil Aviation Week starting on June 23. This particular day is the twentieth birthday of the Civil Aeronautics Act of 1938.

The far-flung CAA, responsible more than any other single organization for safety in the skies, is planning and working hard to prepare for civil jet aircraft operation, and to expand and modernize its vast network of airways to meet the needs of the dynamic and rapidly growing aviation industry.

JAMES V. BERNARDO
DEPARTMENT OF COMMERCE
WASHINGTON 25, D. C.

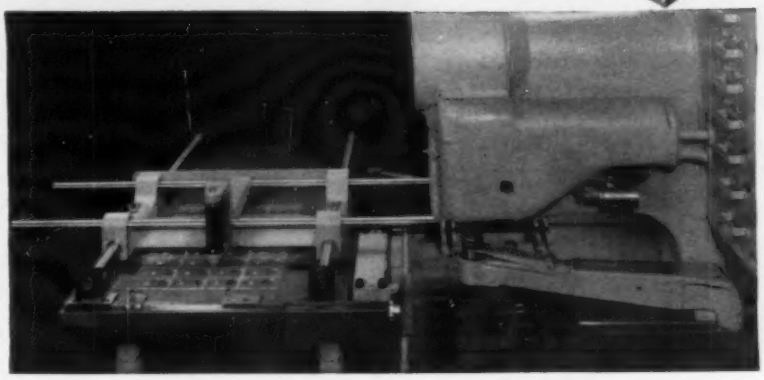
Order of Magnitude

Wow! Either relay sales have dropped drastically since the last time I looked, or there's an error of several orders of magnitude in your Production and Sales department (May 30, p 14). Something like 20 million relays worth around $150 million changed hands last year, I believe, not 20,000 for $150,000. Am I right?

GEORGE L. HUNGERFORD
QUINCY, MASS.

Reader Hungerford is quite correct. The graphs should be indexed in millions of dollars and millions of units. The projected sales for 1958 should be 24.5 million units for $175 million.

drilling or die-stamping printed circuits?



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No matter how complicated the hole pattern, if it's a medium run within a capacity of ¼" mild steel, there's no easier or faster way than with a Strippit Fabricator-Duplicator!

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It's simple to operate — anyone can be hitting high production after a few minutes' instruction. Place master template in Duplicator. Place up to 15" x 25" circuit board or other work in Fabricator. Then, as you place the Duplicator stylus in each template pilot hole, the work is automatically positioned and the punch tripped. Tool changes are made in *seconds*, using the complete line of standard punch and die buttons in the Fabricator's handy "file drawers" — or special-shape tools can be made to your order.

Write today for engineering details and a demonstration at your plant. See how this machine could be cutting your costs — and paying for itself in a hurry under our pay-as-you-produce plan!

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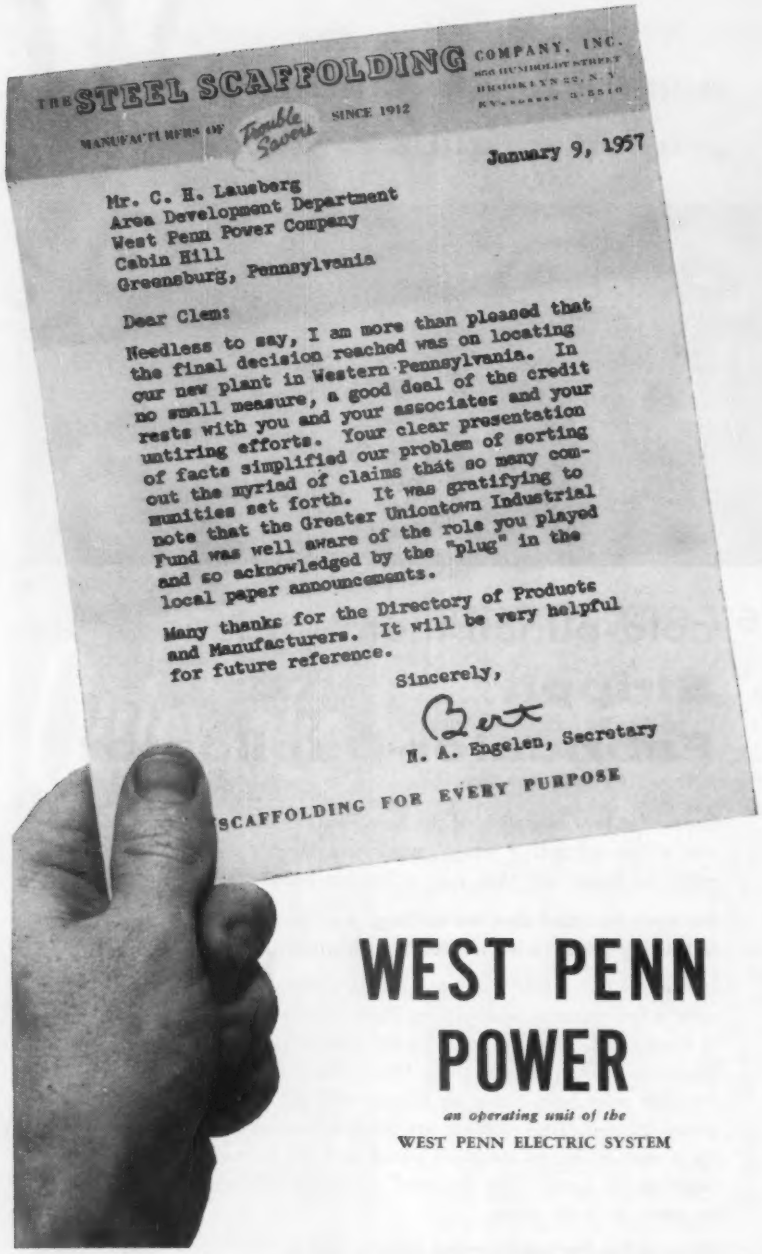
THE STEEL SCAFFOLDING COMPANY, INC.
MANUFACTURERS OF Trouble Savers SINCE 1912
January 9, 1957
Mr. C. H. Lausberg
Area Development Department
West Penn Power Company
Cabin Hill
Greensburg, Pennsylvania
Dear Clem:
Needless to say, I am more than pleased that the final decision reached was on locating our new plant in Western Pennsylvania. In no small measure, a good deal of the credit rests with you and your associates and your untiring efforts. Your clear presentation of facts simplified our problem of sorting out the myriad of claims that so many communities set forth. It was gratifying to note that the Greater Uniontown Industrial Fund was well aware of the role you played and so acknowledged by the "plug" in the local paper announcements.
Many thanks for the Directory of Products and Manufacturers. It will be very helpful for future reference.
Sincerely,
H. A. Engelen, Secretary
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We take credit for just this: We like to add two plus two and get four—no fractions. If you'd like us to work on your side of the equation, let us know. We've got a pretty good record of fours. Won't you let us prove it . . . in confidence, of course.

CHARLIE M. FIFE, *Manager*
Area Development Department

WESTern PENNsylvania

Area Development Department,
West Penn Power Company,
Cabin Hill, Greensburg, Pennsylvania

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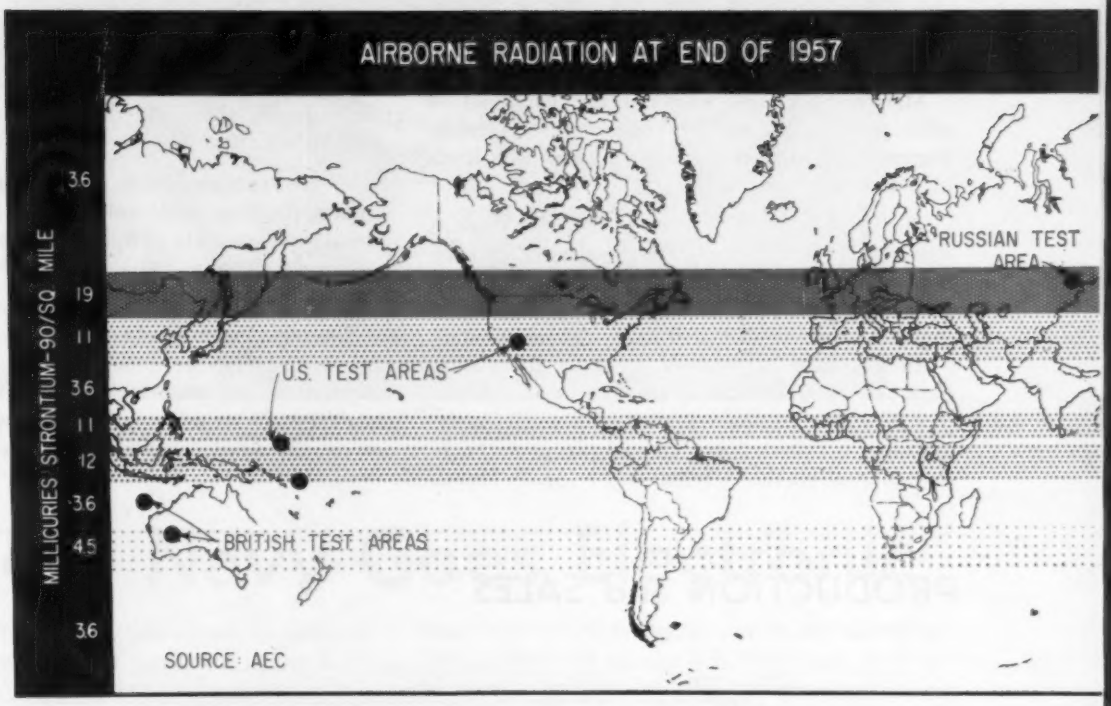
electronics
business edition
JUNE 13, 1958



AEC says current testing won't raise airborne radiation significantly, but to be sure. . . .

Monitors Ring A-Bomb Test

Weather and radiation survey teams equipped with electronic gear guard against radiation dangers during tests now going on in Pacific. World network of fallout sampling stations gathers data

HARDTACK, the current nuclear weapons test series at Eniwetok, is ringed with electronic equipment guarding against dangerous fallout and gathering radiological data.

Radiation monitoring is not only a safeguard for people near the test area. Results will guide military and civilian defense actions.

A prime aim of the tests is development of "clean" bombs for antiaircraft, antimissile and antisubmarine weapons.

The most vital safety job electronics has in the test monitoring program is helping predict fallout patterns. Detonations can be allowed only when harmful fallout will land in the proving grounds.

Probable fallout areas are figured for each test on a large, scientific electronic digital computer fed blast data and latest weather reports.

Special weather stations are located at Eniwetok and 13 other Pacific islands. Ships, planes, rockets and balloons also gather data. A typical station, has more than $25,000 in electronic equipment; upper air sounding devices, $22,000 to $25,000; recorders, $2,500, and miscellaneous equipment, $1,000.

The radiation safety warning and monitoring network has 14 stations on inhabited atolls near the test area. Teams manning the stations have standard military electronic radiation scaling and counting equipment (radiac) and two-way radios.

Aircraft also monitor populated areas after each blast. A variety of ships, skiffs and buoys containing recording equipment is used in the test area.

Radiation is not expected to harm marine life.

outside the test area. As in previous test series, however, data will be gathered for studies of radioactivity in the sea.

Navy vessels are sweeping the area, taking readings of radioactivity in surface and subsurface waters, plankton and fishes. Similar surveys are going on at the islands.

Monitoring at 107 stations in the U.S. and 70 other places in the world is conducted for scientific purposes and to keep the public informed on levels of radioactivity (see map).

The Public Health Service operates 42 stations equipped with standard counting devices and airborne dust gathering machines. Radiation readings are made daily. The dust samples are sent to Washington for analysis with scientific radiation counters.

Another U.S. network, 46 Weather Bureau stations and 11 AEC stations, also collect fallout samples for study.

Fallout is collected on gummed plastic at the 70 locations outside the U.S. and sent to AEC's Health and Safety Laboratory in New York City. The plastic is burned, the ashes are fixed on tape and the tape is fed to automatic radiation analyzers (cover).

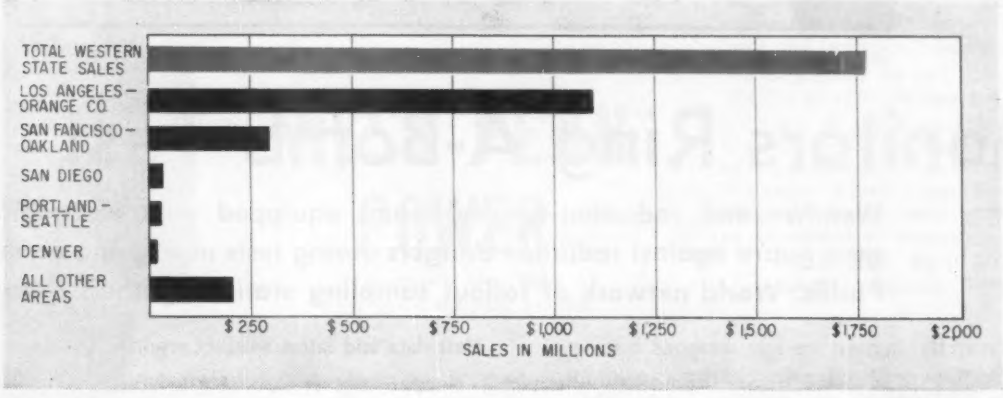
The analyzers handle 400 samples a day: fallout plus soils, food products, bones, fishes, fog and other oddments from all over the world. The information is used in a continuing radiological study.

In addition to the U.S.-sponsored stations and laboratories, there are other laboratories making similar scientific studies.

When tests were made in the continental United States, the same world-wide network was used. The local instrumentation differed. Unattended, continuously recording equipment has been set up for years around the Nevada test site.

During Operation Plumbbob about a year ago, AEC used 17 zone monitoring teams. Automatic equipment, reporting by telephone signals, was installed in 29 towns around the test area. Seventeen radiation recorders were used at the blast area, as well as aerial surveys.

PRODUCTION and SALES



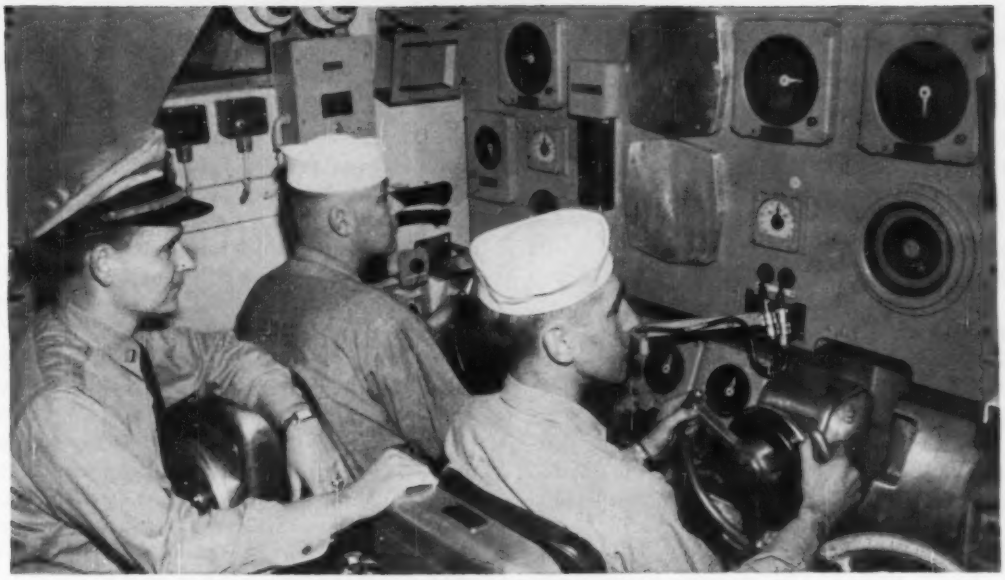
West Posts 23% of Industry's 1957 Sales

ELEVEN WESTERN STATES produced sales of $1.775 billion last year, 23 percent of total U. S. electronic factory sales of $7.6 billion. California, Oregon, Washington, Arizona, Nevada, Idaho, Utah, New Mexico, Colorado, Wyoming and Montana make up the group.

Five electronics centers accounted for 86.1 percent of the West's 1957 sales total. The Los Angeles-Orange County center, with sales of about $1.1 billion, delivered 64.0 percent. San Francisco-Oakland, with sales of $301 million, had 17.0 percent, according to statements by West Coast Electronic Manufacturer's Association leaders last month.

Sales total of the other three centers were: San Diego, $37 million, 2.1 percent; Portland-Seattle, $31 million, 1.8 percent and Denver, $22 million, 1.2 percent. Remaining $210 million, 10.8 percent of total, was spread among other parts. The rapidly growing Phoenix-Tucson center, part of the remainder but not separately mentioned, accounted for $55 million of sales in 1956.

Some 664 western firms employed 123,200 people last year, 18 percent of total U. S. electronic employment, according to WCEMA.



Controlling a nuclear submarine is a lot like flying a plane. There'll be more instruments, controls, navigation aids and automatic equipment seaborne as . . .

Nuclear Navy Goes Electronic

LAUNCHING of the nuclear attack submarine *Skipjack* two weeks ago was another giant step in the U.S. Navy's progress into the era of long-range ultra-powerful nuclear ships.

Launching coincided with the return of elder sisters *Seawolf* and *Skate* from extended exercises. The *Skate*, fresh from establishing a couple of new records, came home to General Dynamics' Electric Boat shipways at Groton, Conn., for an overhaul of its electronic systems. In addition to all the gear she already carries, *Skate* will be fitted out as a seagoing guide for Regulus missiles.

Nuclear Navy—which so far is mostly an undersea navy—will be far more electronic than its diesel counterpart. Exactly how much more is somewhat unclear at this point. One Electric Boat engineer told ELECTRONICS "the electronic systems are taking shape side by side with the development of the vessels they go into." A Navy electronics officer remarked "each time we take one of these ships out, we get new ideas for improving the equipment."

This much is clear: a hefty percentage of the cost of an atom-powered ship will buy electronic systems. The percentage will vary inversely with the size of the ship: 5 or 7 percent for aircraft carriers, over 10 percent for a cruiser, 15 percent or more for a destroyer and well over 20 percent for a submarine.

Cost of the atomic navy is going up steadily. Navy expects to spend over $4 billion during the next five years for nuclear vessels. Atomic submarines carry a price tag today of about $45 million. Missile-launching subs, when they come, will run in the neighborhood of $100 million.

Navigation gear alone on these submarines will cost over $500,000.

Rough comparison between requirements of the old fleet and the new can be derived from ship's complement figures: conventional subs carry about 5 electronic technicians; 17 of the 85-man crew on a nuclear attack submarine are electronics men.

Nuclear navy right now shapes up like this: one carrier is on the ways at Newport News, Va.; a cruiser is abuilding at Quincy, Mass.; one missile-armed frigate (large destroyer) is planned; three submarines are operational, with the fourth (the *Skipjack*) just launched, thirteen more scheduled and requests for seven additional subs before Congress.

Increased performance capability is driving the Navy more and more deeply into electronics. Atomic ships can go far, run silent, fast and deep, hit hard, and stay out of port for a long time. Consequently they need more farseeing radar and sonar, more precise navigation gear, better fire-control equipment and rafts of instruments. The nuclear plant too needs its instruments, detectors and controls.

Electronics is now an integral part of every phase of shipboard operations:

• Radar gets the ship into and out of home port. According to one Navy officer, this is just about the

only use to which radar is put in attack and killer submarines. Of course, the emphasis shifts in radar picket subs like the soon-to-be-launched nuclear *Triton*, which will be the largest submarine ever built and will carry two reactors.

• Radio equipment is going to higher power, lower frequency, so that it can get the necessary range to keep the wandering subs in communication with the rest of the Navy. For emergency or secure communications, Navy now takes advantage of tight radar beams: operators "searchlight" each other, then key the set in code.

• Gyrocompasses and dead-reckoning computers navigate the ship. Future missile-launching submarines will use radiometric sextant, ships inertial navigation system (SINS) coupled with navigation data-assimilation center computers (Navdac).

• Hydroplanes on a high-speed sub must also be controlled electronically, whether the ship is under automatic or manual control. Present-day automatic controls keep the ship at a preset depth, attitude and course. Similar controls will be integrated into SINS when that system goes into the Polaris-armed subs. Big gyros may find use in the submarine fleet as gyro-stabilizers to maintain ship's attitude under perfect control.

• Electronic controls run the nuclear power plant, monitor the ship for radiation.

• Sonar finds the target. Most subs in the fleet are antisubmarine weapons, with surface vessels as secondary targets. Present-day sub-borne sonar has at least three times the range of radar, allows ship to stay below periscope depth, produces bearing angle to double or treble the precision of radar.

• Sonar, radar and other data are presented to and integrated by analog director equipment to control torpedo fire and other ordnance. A gunnery officer starts with only bearing data from the sonar; using rate of change of bearing and rpm rate of the target vessel's screw, he and his fire-control computer can figure out distance, firing angle, fuze setting—"so accurately," comments a submarine gunnery officer, "that we don't have to send out a homing torpedo to get the target."

• Even the ordnance is becoming more electronic. A big part of Regulus and Polaris is made up of control and guidance apparatus. Torpedos today home on target by a combination of electronic and acoustic techniques. Some torpedos use an improved proximity fuze.

Most nuclear vessels, going so far so quietly, can put countermeasures reconnaissance equipment to good use. All of them carry it. ECM gear now shipborne permits intercept, display and analysis of a-m, f-m and pulse signals, also determines direction of signal source.

Specialization will characterize the equipment going into the new ships. All subs, for instance, carry surface search and fire-control radar, loran, sonar, identification beacon, passive ECM gear. Some attack subs also carry air-search radar. Others carry missile controls or early-warning radar. Radar picket subs carry all of this plus height-finders, tacan, short and medium-range radar for multiple air search, radar target simulators. Missile-launching ships carry much of the same with displays stabilized for true north and compensated for ship's own motion.

Nuclear cruisers and carriers will use electronic-scan radar. The island on the carrier will be squared off so that each side forms a reflector. Electronic scan eliminates physical movement of the reflector, permits higher power levels and consequent greater range. Similar provision will be made on the superstructure of the nuclear cruiser.

Lebanese Jammer Fights 3 Nasser Stations

BEIRUT—Lebanon is fighting a losing battle against the radio propaganda of the United Arab Republic. Lebanon's first jamming transmitter was acquired May 15 and is in operation against Cairo Radio, Damascus Radio and Cairo's Voice of the Arabs.

An informed source said the jammer, believed to be a 100-kw Siemens transmitter, was not supplied to Lebanon by the U.S. embassy or military, nor by the Point Four program. It makes static or buzz-saw noises on the same medium-wave frequencies as the UAR radios.

But the Cairo and Damascus radios are meeting the Lebanese jamming by increasing their news commentaries and broadcasting them all at the same time. Present Lebanese jamming gear is thus insufficient to meet the Nasser propaganda offensive.

Cairo's Voice of the Arabs (VOTA), on the air 18½ hours a day, is putting out 200 kw; it is understood that this will soon be increased to 250 kw and eventually to 500 kw. Damascus Radio uses two coupled 50-kw transmitters 15 hours a day. Cairo Radio beams one program 17 hours a day from a 150-kw medium-wave transmitter and a second 11 hours a day at 50 kw.

VOTA and Cairo Radio are believed to be using British and German equipment. But Nasser is counting on new gear from the USSR to increase transmitting power. Damascus is expected to get new Soviet and Czech gear which will increase its power to 150 kw and eventually to 300 kw.

Higher R&D Profits Needed

Electronics manufacturers say profit ceiling on research contracts must be raised. Growing proportion of low-margin R&D work makes it hard to attract capital, they assert

RATE OF PROFIT allowed on research and development type contracts must be increased. So say mounting numbers of electronics and missile-aircraft manufacturers these days.

Present research contract procurement system with a customary ceiling of seven percent is an anachronism, they say. Devised to fit conditions which existed during World War II, the system does not fit today's fast-changing military technology.

Formerly the ratio of production to research contracts was in the order of 50 to 1, says Harper Woodward, board member for a number of electronics and missile aircraft firms. Today, research makes up a much bigger portion.

On production contracts, let at fixed prices and with production incentives, firms could figure on seven to nine percent profit on sales, even after renegotiation. On cost-plus-fixed-fee research contracts firms are left with a maximum profit of four to five percent.

The trend toward smaller production runs and fewer production contracts has had the immediate effect of lowering earnings and profit margins for many military manufacturers.

For instance: "Decreased net income in 1957 was not unexpected because cost-plus-fixed-fee contracts with lower percentage of profit constituted 76 percent of company sales volume," says a missile manufacturer.

"Despite high sales in 1958, earnings will be down because of the higher proportion of research contracts," comments a large manufacturer of electronic guidance systems.

A long-range effect may be a weakening of the electronics industry's ability to attract new capital. For example, one brokerage firm recently advised its clients to pay close attention to differences in number of production and research contracts in making investments in military manufacturers.

Manufacturers with freedom of choice in deciding what products to make usually will choose the high profit items. Evidence of this economic force can be seen in trend toward seeking more industrial business by electronics manufacturers and the number of missile manufacturers concentrating major efforts on high-profit comparatively simple missiles with production contract possibilities.

"Consideration must be given to higher rates on research and development contracts," says J. G. Beerer, vice president of North American Aviation's Missile Development Division. Executives of Martin, Lockheed, Temco and other military contractors voice similar sentiments.

Although the custom of allowing a top profit rate of seven percent on research contracts is well-established in military procurement, there is nothing in regulations barring higher rates. Armed Services Procurement Regulations allow for payment of rates up to 15 percent on cost-plus-fixed-fee contracts; and even up to 20 percent with special permission of the Secretary of Defense.

Reason why higher rates haven't been used goes back to initial rate decisions in World War II. Once established, the seven percent "ceiling" became rooted in procurement practice.

If procurement officials down the line allow a contract at the usual seven-percent rate they are safe. If they deviate from customary practice, they have to justify their position, often in writing.

C. G. Bannerman, acting director of procurement policy for the Department of Defense claims policy of the department now is to pay higher rates on hard-to-do contracts but he sees little possibility of raising the average research contract rate. He says the department is already paying as high as 10 percent on some contracts, while admitting that most run about seven percent.

On the real difficult contracts he would like to see rates up to 15 percent allowed; and even, on occasion, up to 20 percent with special permission of the Secretary of Defense.

Bannerman further claims that in recent weeks the Defense Dept. has been having discussions of the new policy with procurement officers and has been instructing them on it.

Some manufacturers say they have already seen evidence of the new policy with occasional contracts at rates up to 10 percent.

Police Radio Market Grows

Manufacturers find an increasing number of buyers among state authorities looking to radio for aid in patrolling and maintaining the nation's expanding highway system

As THIS YEAR PASSES the halfway mark, highway authorities are shaping up as major consumers of microwave and mobile equipment.

Recent tabulations of roadbuilding activity show that during the past year more than 22,844 miles of highway have been built. Industry spokesmen say many of these roads will be using radio in one form or another.

"A shot in the arm" is the way one manufacturer describes the nation's highway construction programs. Under construction are about 24,000 additional miles, with about 3,800 more to follow.

Some indications of how this has affected the 1958 radio equipment market are:

In February, Illinois spent almost a million dollars for a 187-mile microwave radio system for the Illinois Toll Highway. Slated for completion this year, the system will link police with maintenance and administration facilities. The network will also service 150 mobile units from 11 fixed stations.

Microwave and mobile radio installations along U. S. highways multiply steadily

In March, North Carolina's Highway Department began purchases of mobile two-way radio equipment for what will grow to be a 400-unit system. Many of the 175 two-way radios already in use on Tarheel highways are transistorized.

Microwave radio systems are in use on the Florida Turnpike, the Massachusetts Turnpike, and the Richmond-Petersburg Turnpike in Virginia.

A partial explanation for state interest in radio systems may be found in the conditions under which states receive federal aid for roadbuilding. Provisions of the Gore Bill, dealing with highway construction, are that federal funds will pay up to 90 percent of costs while state funds pay the remaining 10 percent.

The "catch," however, is that the state must pay all maintenance costs. Obligations for policing, traffic control, and assistance to drivers run into some large figures. Radio communication has proved of great value in helping to do these jobs.

Last month, California's division of highways awarded a contract for 325 50-watt two-way radios.

Another sale last month was concluded with the Connecticut Highway department for over a half-million dollars. Equipment includes 350 mobile units, 34 base stations and full maintenance.

In addition to state agencies, municipal authorities represent a potential market for microwave and mobile equipment that one manufacturer says is "hardly tapped".

A $600,000 contract for fixed and mobile equipment was signed by the city of Philadelphia early this year. Sixteen base stations nearing completion will blanket the city, and link any mobile unit with any other unit or office in the system by microwave relay.

Last month, San Francisco's police department went on the air with a 200-unit mobile system. Mobile units throughout the city are now incorporated into a four-section system consisting of squad car patrol, motorcycle squad, juvenile bureau and special services. Each precinct house has its own base station.

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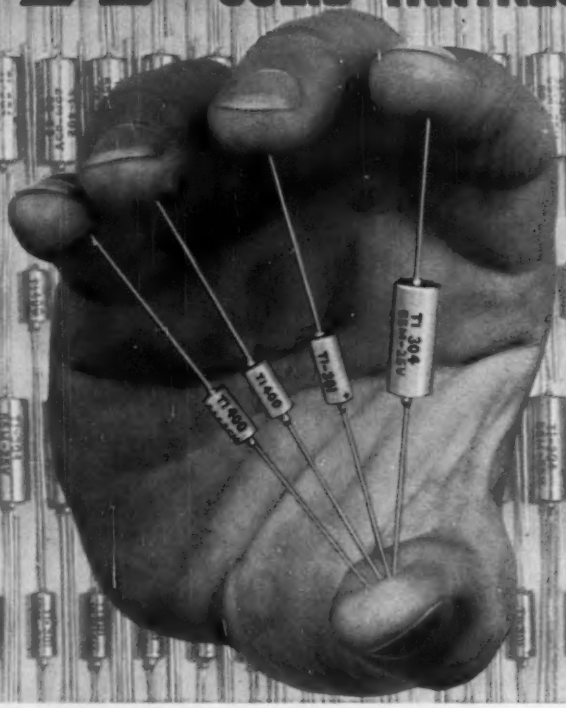

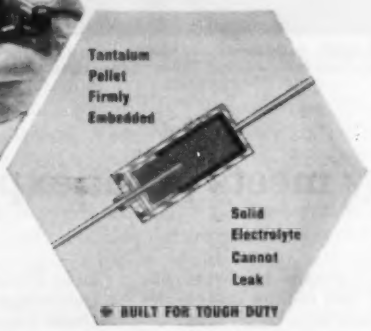

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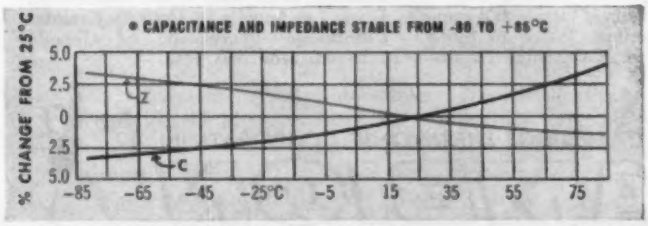

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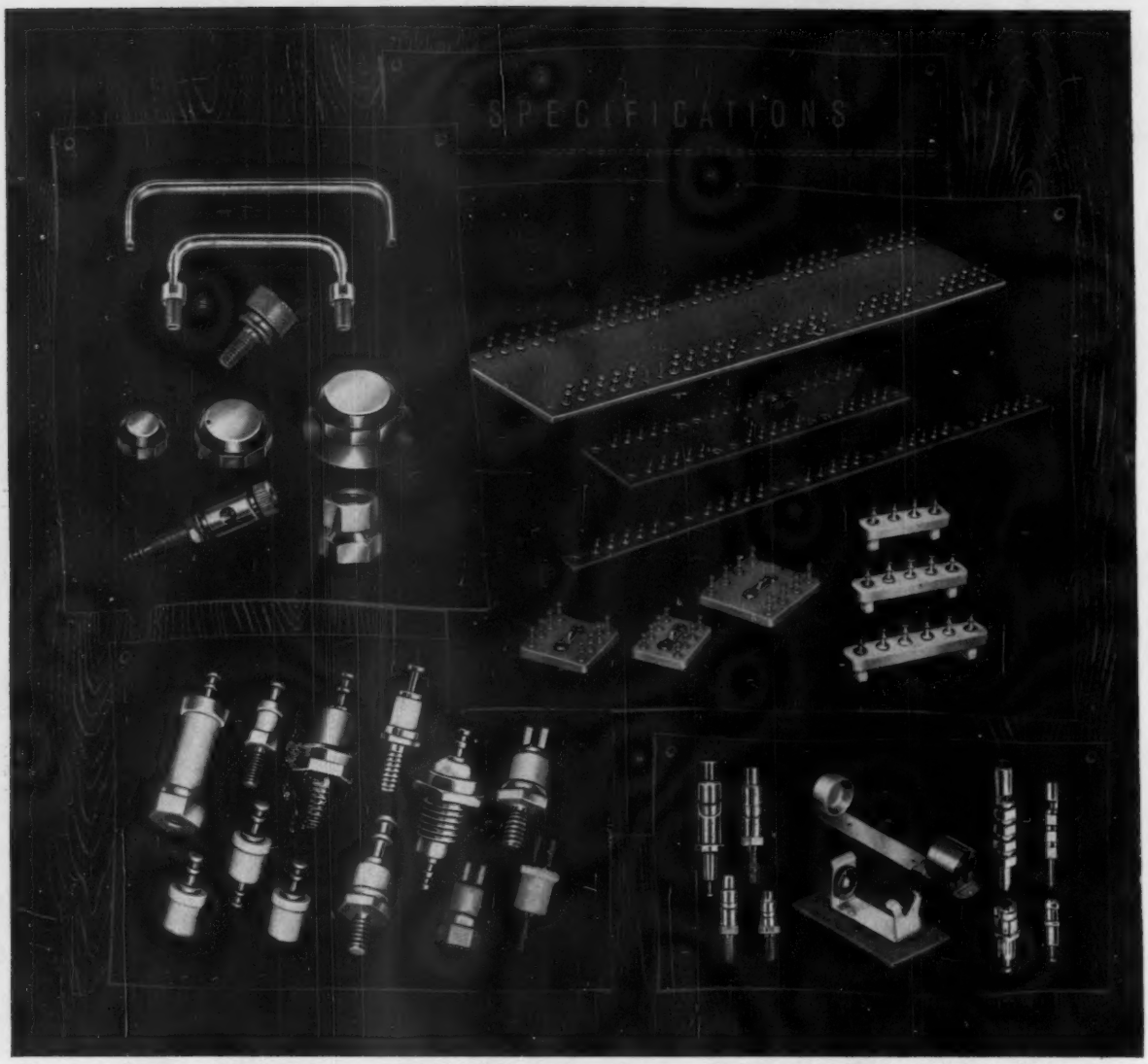

Photo shows wide variety of Cambion® components. Upper left, handles, knobs, panel screws, and binding posts. Upper right, standard and miniature terminal boards, phenolic and ceramic. Lower left, split lug terminals, insulated terminals in ceramic and Teflon.* Lower right, diode clips, battery clips, plugs and jacks. Common denominator — Cambion reliability.

*DuPont Reg. T.M.

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ENGINEERING REPORT

Leasing of Gear Gains Favor in East

ELECTRONIC GEAR LEASING is gaining a foothold in the East after about five years of growth on the West Coast. This standard practice of makers of big computers and data-processing equipment is now also finding favor with makers and users of lab and production instrumentation, and environmental test devices. Some indications: A giant corporation has a policy of "restricted" leasing for labs and shops, depending on the type of device and how long it will be needed; a pioneer radio firm that does not have its own direct leasing arrangements, will give users the names of companies that specialize in leasing electronic gear; a maker of environmental test equipment reports "definitely increased interest in leasing during the past year." Leasing advocates argue: Keep working capital working, instead of tied up in frozen assets. It's use, they stress, not ownership of capital assets that is important.

RANGE OF RADAR EFFECTIVENESS may be greatly improved by bouncing it off the moon, recent research suggests. The University of Michigan Engineering Research Institute says its studies indicate that very short wave radio or radar signals bounce off the moon without appreciable loss in quality. Analysis of signals reflected from the moon is also said to be yielding data on the composition of the moon's surface. U-M research for the Rome Air Development Center indicates that a short wave signal needs an area of only a few square feet to be reflected, and that the moon has areas that are smooth enough to reflect a signal with little loss in quality.

MOON DATA may soon be obtainable at short range from an orbiting space vehicle. This was stated at the recent USAF astronautics symposium in Denver by John Barnes, president of the Systems Corp. of America. He said that the data, acquired and stored by the vehicle as it circles the moon, could be telemetered back to earth once the vehicle is in the earth's vicinity. Possible tasks for electronic gear: providing infrared and ultraviolet maps and color telephotos for visual range maps. At the same symposium three MIT Instrumentation Laboratory scientists said that if R&D started today, it would be possible to launch a space vehicle to Mars in five to seven years for photoreconnaissance. Round trip would take about three years.

RUSSIA'S 10-BILLION ELECTRON VOLT SYNCHROTRON has been perfected with the help of Bruno Pontecorvo, the ex-British scientist who defected in 1951, a Soviet report says. The synchrotron has been "reconstructed" with a much greater beam intensity than before.

TECHNICAL DIGEST

• **Corrosion thinning** of metal plates can be measured from one side without use of radiation, in simple technique described by Department of Mines, Canada. Four electrodes in row are held against metal. Direct current up to 10 amp is sent through metal between outermost electrodes, and resulting voltage between inner pair of electrodes is measured. Actual thickness, proportional to measured voltage, is determined by comparison with voltage reading on sample of known thickness.

• **Streamlining of automobiles** has greatly increased wind noise, so that ambient level inside at 65 mph is about 102 db when windows are open, leaving only small dynamic range for auto radio below 120-db threshold of pain. Delco report on problem suggests use of four speakers, one in each corner of interior, to improve audibility at all seat positions. This gives some stereo effect on full orchestra but impairs single-voice intelligibility.

• **Electroflor materials,** normally colorless, develop red or blue zone of color when electrically activated. Being true color change rather than electroluminescence, color effect is observable in direct sunlight. With the material between fine parallel crossed wires of matrix, selected square dots can be activated to give data display or even numerical readout. The low energizing voltages can be obtained from transistor circuits.

• **Automatic Stereophonic** Recording Amplifier (ASRA) permits production of stereophonic records which are compatible in that they can also be played monaurally on ordinary phonographs. Signals from two stereo channels are added to give sum signal for recording as lateral modulation. Same signals are combined out of phase to give difference signal, about one-eighth of sum signal amplitude, for vertical recording.

On playback in this CBS system, the stereo pickup has two outputs, one corresponding to vertical movements of stylus and the other to horizontal. Amplifier reverses process to give stereo signals feeding separate output transformers and loudspeakers.

On ordinary phonograph, lateral modulation gives sum signal, which sounds essentially like single-channel record.

Computer to Control Power Distribution

MOMENT-TO-MOMENT use of electricity by 1,940,000 customers in the Chicago area is to be controlled by a computer. The computer will regulate the outputs of generators to meet the exact demands of Commonwealth Edison customers.

Major components of the system have been ordered from GE. The installation is expected to be completed in about two years.

It will distribute power from twelve generating stations, which last year turned out nearly 20 billion kilowatt-hours of electricity.

While coordinating total output to meet total demand, it will also determine which of the generators then in operation most economically meets the need. Then, by remote control, it will step up or lower output of the individual machines.

For example, when additional power is needed on a particular part of the system, the device will determine which generator can turn out the extra electricity at the lowest delivered cost. Conversely, if less is required, it will determine, on a cost basis, which machine should reduce output.

It will then send out signals to the control mechanism of the turbine generator selected and automatically regulate its output.

The device will also help to maintain the scheduled interchange of power with other utilities in a large power pool.

Load on power-generating equipment is continually changing. It may be twice as high at two o'clock in the afternoon as it is at two in the morning. The noon hour brings a big drop in use as workers stop for lunch. Even the morning coffee break can be identified on the load charts.

The utility knows the cost at which each machine produces electricity. Several factors are involved in this determination: the amount of fuel required, the cost of transporting the fuel to the station involved and the transmission cost of getting the electricity from the point of generation to the point of use.

This information, constantly revised to meet changing conditions, will be fed into the computer in advance. The computer almost instantaneously will translate its knowledge into control signals for the generators.

Character Tubes Help Defense

Tracking consoles were put in operation as part of early warning system for Baltimore-Washington area. Du Mont character display tubes show data in the form of letters, numbers and symbols to coordinate Nike missile and other antiaircraft weapons

MEETINGS AHEAD

June 16-18: Electrical Contact Seminar Div., Penn State Univ., Pa.

June 16-18: Military Electronics Second National Convention, Sheraton Park Hotel, Washington, D. C.

June 17-27: Two-Week Special Summer Program in Switching Circuits, MIT, Cambridge, Mass.

June 18-20: Radio Wave Propagation Statistical Methods, Univ. of Calif. Engineering Extension, L. A.

June 22-27: Air Transport Conf., and AIEE Summer General Meeting, Statler Hilton, Buffalo, N. Y.

June 23-27: Vacuum Metallurgy, Summer Seminar, New York Univ. Coll. of Engineering, N. Y. C.

July 6-18: Underwater Missile Engineering, Graduate Course, Penn State Univ., Pa.

July 8-17: International Electrontechnical Commisison, ASA, Stockholm, Sweden.

July 16-18: Forestry Conservation Communications Assoc. (FCCA) Ninth Annual Conf., Parker House, Boston, Mass.

Aug. 6-8: Special Tech. Conf. on Nonlinear Magnetics and Magnetic Amplifiers, AIEE, Hotel Statler, L. A.

Aug. 13-15: Conf. on Electronics Standards and Measurements, AIEE, IEE, NBC, National Bureau of Standards Labs., Boulder, Colorado.

Aug. 13-15: Seventh Annual Conf. on Industrial Applications of X-ray Analysis, Denver, Colo.

Aug. 19-22: Western Electronic Show and Convention, Los Angeles, Calif., WESCON, IRE, WCEMA, Pan Pacific Auditorium, Ambassador Hotel, L. A.

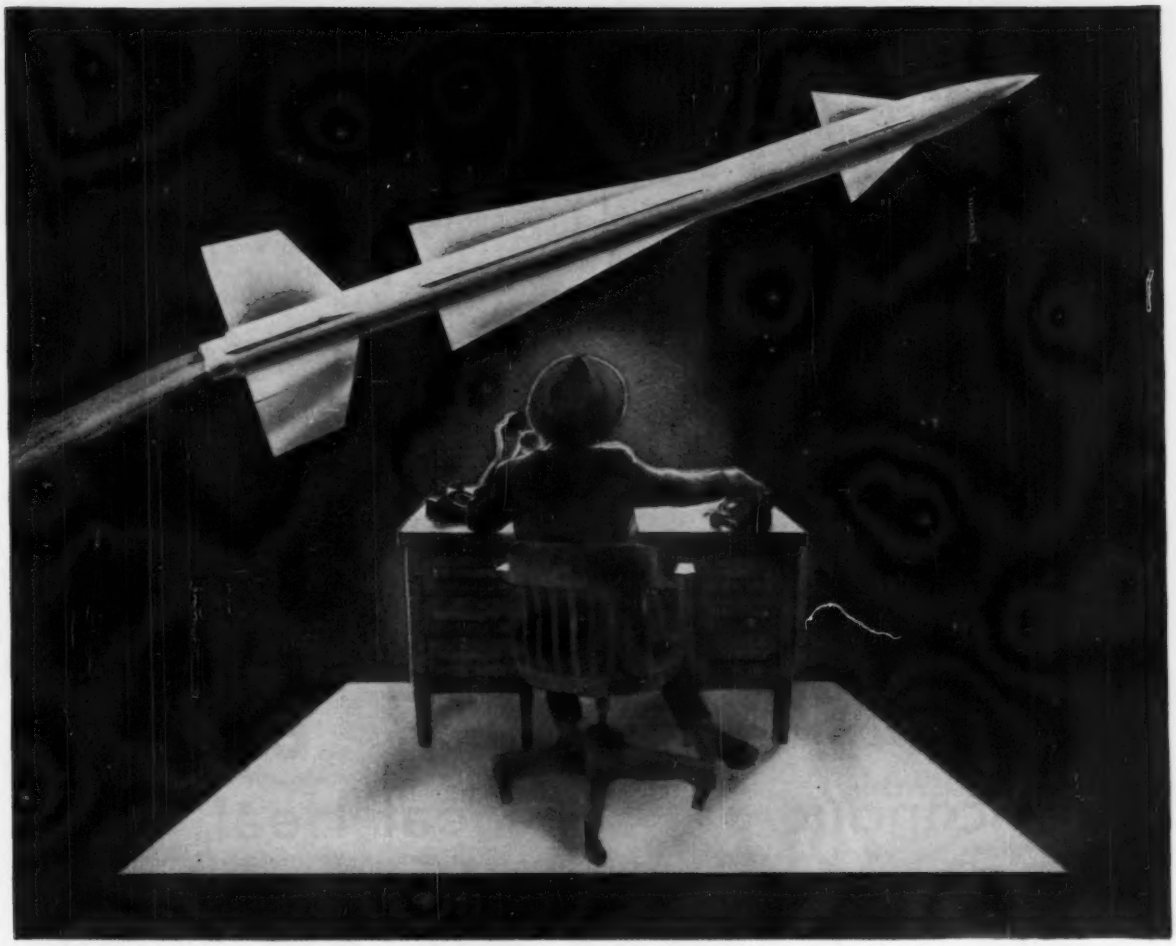
Aug. 26-Sept. 6: British National Radio Show, Radio Industry Council, Earls Court, London.

Sept. 1-9: Second International Days of Analog Calculations, Strasburg, France, contact F. D. Raymond, 138 Boulevard de Verdon, Seine, France.

Sept. 3-5: Application of Electrical Insulation, First National Conf., AIEE, NEMA, Cleveland, Ohio.

Sept. 12-13: Communications Conf., IRE, S-M Hotel, Cedar Rapids, Iowa.

Sept. 16-20: Nuclear Electronics Conf., Societe Des Radioelectriciends, U. N. E.S.C.O. House, Paris, France.



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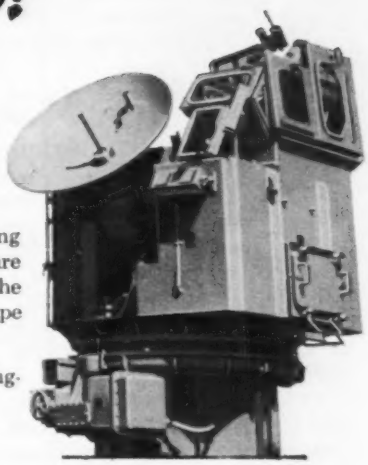

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Semiconductor		Band Gap (ev)	Mobility cm²/v-sec Electrons	Holes	Melting Point °C	Recti-fiers	Transis-tors	Infra-red	Galvano-magnetic	Photo-electric
Diamond		6	.....	.....	3,500	√	√			
Silicon Carbide	Si C	3	50	10	2,700	√	√			
Aluminum Antimonide	Al Sb	1.6	1,200	300	1,080	√	√		√	√
Cadmium Telluride	Cd Te	1.45	.....	.....	1,045	√	√	√		√
Gallium Arsenide	Ga As	1.35	4,000	200	1,240	√	√	√		√
Indium Phosphide	In P	1.25	3,400	650	1,070	√		√		√
Silicon	Si	1.1	2,000	500	1,420	√	√	√		√
Germanium	Ge	0.72	3,600	1,900	936	√	√			√
Gallium Antimonide	Ga Sb	0.7	4,000	700	7,200	√	√			
Lead Telluride	Pb Te	0.3	2,000	1,100	920			√		
Indium Antimonide	In Sb	0.16	70,000	500	523			√	√	
Mercury Telluride	Hg Te	0.08	10,000	.....	700			√	√	

A few promising semiconductors and applications. One possibility that keeps research buzzing is . . .

Semiconductors Can Beat Heat

Lab men eye built-in transistor coolers while readying heat-tolerant semiconductors for market

SEMICONDUCTOR devices rate as prime movers of electronic design and application. Research in semiconductor materials is intended to insure that momentum.

There are several kinds of semiconductor energy conversions which have not been fully exploited—photoelectric, thermoelectric, infrared detection and Hall effect devices, chiefly.

For example, electronics has lived with temperature problems a long time. In coming years, semiconductors may solve heat-cold complications or, better yet, put them to work.

In addition to frontal assaults on heat with high temperature semiconductor devices, there is considerable interest in thermoelectric devices. Among the possibilities are:

• Transistor power dissipation: miniature Peltier effect refrigerators built into the transistor. They would cool in proportion to the current, enabling a three or four-fold extension in power.

• Equipment temperature control: a combination of thermoelectric junctions could cool when temperature rises and heat when temperature falls.

• Perpetual power supply: electricity could be siphoned from atmospheric cold or heat and used as a source of power.

Discussing these and other energy conversions possible with semiconductors, experts in the field say that so far there has been a lot more excitement than accomplishment. The chief drawbacks are size and weight of the devices. More efficient semiconductors are required for practical use other than in electronic circuit applications.

Finding the right semiconductors could be just a question of time. Efforts have gone beyond primary and two-element semiconductors. They are presently centering the three-element compounds.

Single-element semiconductors, like silicon, have four valence electrons. A compound with an average of four valence electrons can also be a semiconductor. There are thousands of possible ternary compounds in elements in Groups 1 through 6.

Researchers have barely begun cataloguing. So far, they have investigated dozens of organic semiconductors and hundreds of inorganic ones.

Research in solid-state devices, stirred by the development of selenium rectifiers in 1930 and radar detector diodes during World War II, has been intense since the invention of transistors in 1948. There is a waiting market today for any good new component.

Manufacturers agree that silicon, germanium and selenium devices will dominate the commercial scene for years to come. However, a number of compound semiconductors are being primed for specialized applications.

Interest seems concentrated in silicon carbide, gallium arsenide

and aluminum antimonide. These are promising for rectifiers, transistors or diodes which are relatively insensitive to heat.

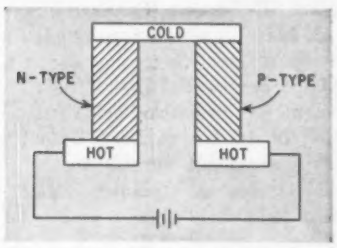
None is actually new. Until five or six years ago, they could not be made in desired purity or were not recognized as useful semiconductors. Rapid progress in crystal growing techniques has also spurred investigations.

Except for silicon carbide, the compounds have lower melting points than silicon. They have high energy band gaps, however, which permit high operating temperatures before transistor action deteriorates.

One leading firm's coordinator of advanced semiconductor engineers rates silicon carbide good for rectifiers and feels gallium arsenide will be fine for microwave diodes. He feels their use in transistors is far away.

An engineering vice-president warns of great difficulty in growing suitable crystals. It is pointed out, though, that these new semiconductors can lead to radiation tolerant transistors operating at 750 C and several megacycles. Silicon carbide device temperature may reach 1,000 C.

Laboratories are making 700 C rectifiers of silicon carbide and 450 C point contact diodes of gallium arsenide. One company recently reported a 6,000-mc gallium



Basic thermoelectric design. Temperature difference, up to 80 C in single units, can be increased by cascading

arsenide microwave diode and computer switch.

Indium antimonide shows limited promise as a transistor material, but could become important in infrared detectors. It probably would not require cooling. Electron mobility is high and suitable crystals can be obtained.

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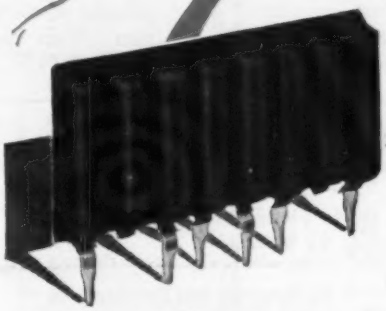

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Primes Give Small Firms 20%

$7 billion a year is small business' military contract take. Half in primes, half in subs

SMALL BUSINESS receives about $7 billion a year in military contracts—half of which are prime contracts and half subcontracts, according to Defense Department statistics.

Although only about one-sixth of the reporting firms are strictly electronic, their take is a quarter of the total amount received. Proportionately, electronics firms spend with subcontractors about the same as do other firms: approximately 50 percent. Again in line with the general picture, electronics firms let about 20 percent of the prime contract dollar volume to small business.

Prime contract awards to small firms—statistics on actual payments are not available—have averaged $3.5 billion a year over the past two years.

During the first six months of last year, 272 large contractors paid out $1.867 billion to their small business subcontractors. Small business in the last six months of 1957 received $1.782 billion in subcontracts from 244 large firms. Total amount reported for 1957: $3.649 billion.

Complete total received by small business in military subcontract payments is of course larger than the above figures. Some firms do not report. Secondly, the statistics cover only amounts paid directly to small business; payments made to firms from subcontractors not reporting are not included.

Here's how the prime contractors' sources are broken down. The 244 companies who reported subcontracts to the Defense Dept. in the last half of 1957 received $8.709 billion in military payments. Of this amount, $7.397 billion came from the government in prime contract payments; the rest, $1.312 billion, was received for subcontract work.

Reporting companies say they subcontracted 20.5 percent of their total military receipts to small business. They spent 35 percent with other suppliers.

MILITARY ELECTRONICS

• **"Development and production** of future vehicles which are primarily electronic devices with frames designed to house the systems, may be managed by electronic companies," Malcolm A. MacIntyre, Under Secretary of the Air Force, said recently at a meeting in New York. "It is possible that the bulk of weapons system business will not go to aircraft manufacturers to the same degree that it has in the past."

MacIntyre also pointed out: "As we progress toward future weapons systems, the pattern of long run production will phase out. During the early stages of space vehicle development and production, quantity orders of ten or less may be the business norm."

• **"Some 40 Atlas ICBM's,** each with hydrogen bomb carrying capability, are scheduled to be located at SAC launching sites by 1959," Maj. Gen. Bernard A. Schriever said to an Air Force Assoc. meeting in Chicago recently. "Schedules are being met," he added. "The missiles will cost $1.5 million each. Development to date has cost $½ billion."

• **Air Research** and Development Command spends about $43 million a year in the U. S. for basic research with 250 universities, colleges and other nonprofit institutions, and about 70 industrial concerns. Additional work is done within the laboratories of ARDC and other government agencies.

ARDC spent $4 million in fiscal year 1958 on 200 contracts originating with ARDC's European office in Brussels.

• **Wright Air Development Command** is currently studying a design proposal for an electronic gyro with no moving parts. No hardware has yet been built. Status of the project at present is a statement of the principles which the submitting company believes will enable the new gyro to work. Two other proposals for gyros (with moving parts) are also being reviewed by WADC.

CONTRACTS AWARDED

Radioplane Div. of Northrop is awarded a $2,352,177 contract with Army Electronic Proving Ground Procurement Office, Army Signal Supply Agency, Fort Huachuca, Ariz., for 85 drones, tv equipment for five SD-1 drones (ELECTRONICS, p 13, May 30) and 20 man-months services to assist in testing; also, a $45,565 contract for design, development, fabrication and field installation of 10 kits in SD-1 drones with government furnished AN/DPN-32 beacons (pilotless radar navigation aids).

Ford Instrument will produce electronic computers for the Tartar and Terrier guided missile systems under a new $14 million contract with BuOrd. The contract will provide Mark 118 computers for the Tartar and Mark 119 computers for the Terrier.

General Instrument wins a $616,203 contract with Army Signal Supply Agency for modification kits for adapting decoder group OA-1134/TPX into interrogator

sets AN/TPX (ground transportable radar identification and recognition); also, a $1,116,960 contract for 23,000 radiosondes, AN/AMT-6.

Northeastern Engineering, Inc., is awarded a $¾ million contract with the Navy's Aviation Supply Office for high speed electronic frequency counters.

Lockheed receives a $2 million R&D contract from the Navy for a "faster, more protective, land-based antisubmarine bomber." The new sub-hunter will be a military version of Lockheed's prop-jet Electra.

Collins gets a $2,750,000 contract with Air Materiel Command for airborne h-f single sideband communications system for the B-52G and KC-135 aircraft.

Magnavox sells components of the AN/APN-59 radar set for the KC-135A, KC-135 and C-130A to AMC under a $1,638,477 contract.

American Bosch Arma wins a $3¼-million contract with the Navy for torpedo fire control systems for submarines.

Space Corp. sells radiosondes amounting to $571,380 to White Sands Proving Grounds.

ACF Industries gets a $741,000 contract with Ogden Air Materiel Area to modify F-86D electronic flight simulators to the F-86L configuration.

CalTech is awarded two contracts by Army Ordnance District, Los Angeles, for engineering R&D relating to guided missiles, free rockets, materials and wind tunnel operation. One contract is for $2,854,000; the other, $947,000.

Ford Motor Co. and Aeronutronics Systems, Inc. (as a joint venture) win a $6,851,000 contract with Army Signal Supply Agency for a design plan and one mobile central operations unit, AN/MSQ-19, and one user test model.

THE FIRST MACHINE-MADE RF COIL FOR

FULLY-AUTOMATIC ASSEMBLY

OF VIDEO IF STRIPS

FEATURES

PATENTED DESIGN
Design consists of a core and outer case molded into a single unit of rugged plastic. Mounting lugs are extensions of the coil itself . . . no separate soldered pieces to loosen. Covered by U.S. Patent 2,836,805.

RUGGED CONSTRUCTION
XL is completely encased in a sturdy plastic cup; requires less care in handling; designed for hopper feeding.

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COILS AND TRANSFORMERS
Standard XL available in one and two windings, complete with adjustable tuning.

The new Essex XL — the first truly *automated coil* — is precision-made *by high-speed machinery* for automatic or hand insertion into printed circuit boards.

Sturdily constructed, the patented XL coil is completely encased in tough, durable plastic . . . in your choice of 8 brilliant colors.

The new XL coil already is saving money for TV manufacturers who have adapted it to the automatic assembly of video strips. XL will speed *your production*, and reduce *your costs*, too. Write today for more information about this amazing new electronic development.

We welcome inquiries from coil manufacturers interested in a license agreement for the manufacture of this unique new coil.

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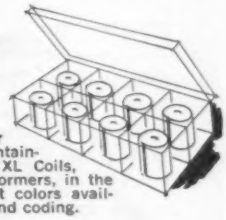

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"But I don't have time to read!"

24 HOURS IN A DAY ... 8 hours to sleep. 16 hours for everything else. "So why is it," we keep asking ourselves, "that some men spend many more minutes reading this fine magazine than other men? And why is it that the men who spend the least time with it invariably insist they're too busy to read?" In any event, here's how you can become the master of time, and not its servant. To wit:

GET UP EARLIER ... Put a new half-hour into your day. Use it to read. While you're shaving. Or at breakfast. Or catch an earlier train. Read that article you may have spotted right in this issue a few seconds ago. "I must be sure to read that," you said. Bet you won't -- unless you create the time to do it.

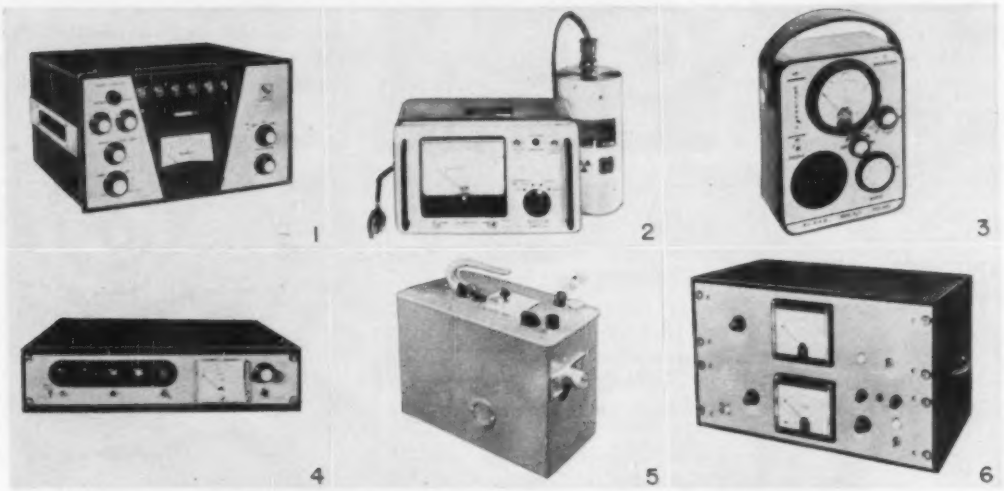
WRITE SHORTER LETTERS ... less involved memoes, unwindier reports. Brevity is business' biggest bargain. Cut your dictating time in half. And it's contagious. Pretty soon, other people will make their replies shorter and sweeter. So you save twice as many minutes for your favorite business publication.

EAT LESS FOR LUNCH ... You put away fewer groceries in a 1-hour lunch than a 2-hour lunch. You feel lots better. Costs less, too. And look at the time you gain! Invest it in reading. Expose yourself to the current experience of men with similar problems and common goals. Know what's going on. Be an "authority".

BE A CONFERENCE "CLOCK-WATCHER" ... Be Succinct. Then sit down. The boss will bless you. If you're in a meeting-happy company, campaign for faster, fewer meetings. Everybody gets more done . . . but you're the big time winner. Explore some of the great things you may have missed in these pages. Find out what's going on in other functions and phases of your industry.

LOOK AHEAD, READ AHEAD, GET AHEAD ... today. Little future for "stand-patters". Be alert. Be informed. Management's watching you. Stimulate your brain cells. Upgrade your viewpoint. And do it on your own terms... as many reading minutes as you like, when and where you want to apply them. For the more time you invest reading your favorite McGraw-Hill business publication, the more time you save to do a better job, to see more of your family, to enjoy life.

Boost Nuclear Electronics



(1) NRD Instrument Co., decade scaler. (2) Jordan Electronics, radiation monitor. (3) Riggs Nucleonics Co., radiation detector. (4) Baird-Atomic, Inc., G-M scaler. (5) Levinthal Electronic Products, survey meter. (6) BJ Electronics, counting-rate meter

THE NUCLEAR ENERGY field has created new markets for conventional and special types of electronic equipment. Instrument output is getting a big push.

NRD Instrument Co., 9842 Manchester Road, St. Louis 19, Mo., (50) announces the model T-1700 decade scaler. It combines transistor and plug-in printed circuitry with preset count controls to provide instantaneous counting results on a six-digit, in-line, neon readout.

In production at **Jordan Electronics**, 3025 W. Mission Road, Alhambra, Calif., (51) is a new remote radiation monitor. Any span of six decades to 100,000 r/hr is covered in two 3-decade ranges and a remotely actuated source checks calibration accuracy of ±20 percent.

Riggs Nucleonics Co., 2390 Olive Ave., Altadena, Calif., (52) has developed the model P-1R small lightweight gamma radiation detector combined with a standard all transistor radio receiver. It features high sensitivity detection background to 100 r/hr, and logarithmic scales.

Now available at **Baird-Atomic, Inc.**, 33 University Rd., Cambridge 38, Mass., (53) is the model 123 G-M scaler. It has an all Dekatron glow tube five-digit capacity with no mechanical register required.

Levinthal Electronic Products, Inc., 760 Stanford Industrial Park, Palo Alto, Calif., (54) offers the N85SM survey meter which is useful for detecting leaks in systems containing radioactive gases. Basically it is composed of an ionization chamber through which air is continuously drawn by means of a blower operated by a self-contained storage battery. Ion current in the chamber is indicated on a meter relay.

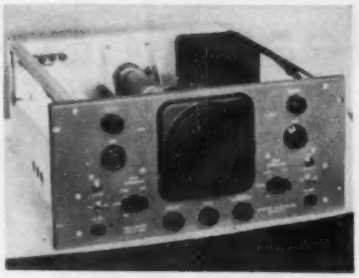
Model DM4 linear counting-rate meter manufactured by **BJ Electronics**, Borg-Warner Corp., 3300 Newport Blvd., Santa Ana, Calif., (55) is designed to count pulses from G-M tubes, scintillation detectors, single channel pulse height analyzers and similar sources.

For more information use READER SERVICE Card

Calibrator time saving device

GILMORE INDUSTRIES, INC., 13015 Woodland Ave., Cleveland 20, Ohio. Model 104 calibrator for calibrating instruments used with resistance type force and pressure cells, rated on a voltage output ratio basis, has been announced. It is used by substituting it for the sensing element in a measuring system. Defective components are easily isolated by substitution. The known outputs of the model 104 are utilized in calibrating, servicing, and installing indicating or recording instruments. **Circle 56 on Reader Service Card.**

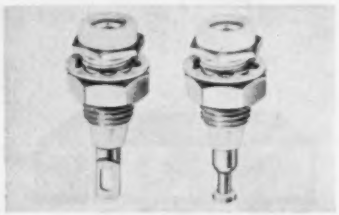
C-R Oscilloscope for systems use



INDUSTRIAL TELEVISION INC., 369 Lexington Ave., Clifton, N. J. Type IT-193A c-r oscillograph has identical horizontal and vertical deflection systems with maximum deflection sensitivity of 0.025 v peak-to-peak per in. from d-c to 150 kc. Relative phase shift of the two amplifiers is not greater than 2 deg below 50 kc. All power supplies including accelerating potential for the flat faced 5 in. crt are regulated. The unit is being used in a microwave system test set and other applications requiring a high reliability d-c oscilloscope which may be easily integrated with other rack mounted equipment. **Circle 57 on Reader Service Card.**

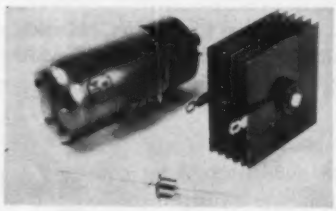
Test Jack high-temperature

RAYTHEON MFG. CO., 100 River St., Waltham, Mass., announces a new test jack utilizing Teflon insulation. It is designed for use at temperatures ranging from −100 F to 500 F, and is available with either spade or turret type solder terminals. The jack features a beryllium copper spring-pin contact which is inverted to provide extra smooth insertion and firm seating of a standard 0.080 test prod. **Circle 58 on Reader Service Card.**



Silicon Rectifier economy priced

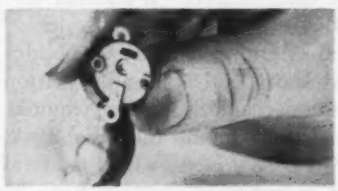
GENERAL INSTRUMENT CORP., 65 Gouverneur St., Newark 4, N. J. The Pt series silicon rectifier (foreground) is priced as low as 40 cents to $1.50 each, depending on the peak voltage required for the application. Rated at 500 ma average rectified current at 100 C, the eight types in the series cover a range of 50 to 500 v. They are designed with convenient pigtail leads for easy mounting in any position. **Circle 59 on Reader Service Card.**



A-C Amplifier transistorized

AVION DIVISION of ACF Industries, Inc., 11 Park Place, Paramus, N. J. The Sensitran is a low-level, all transistor broadband a-c amplifier, adaptable to many applications where the amplification of low-level signals is required under severe environmental conditions. Designed for telemetry systems, it weighs 3 lb and measures 5 by 6 by 3 in., is hermetically sealed and has an altitude range of 200 mi. **Circle 60 on Reader Service Card.**

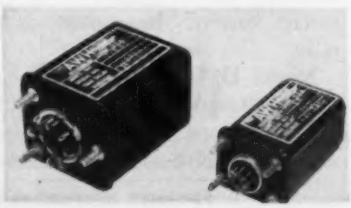
Snap-Action Switch of round design



ACRO DIVISION, Robertshaw-Fulton Controls Co., Columbus 16, Ohio. New "Q" subminiature switch carries a 10 ampere 115 v capacity. Circular design makes it especially adaptable to space-saving applications. The device is available with a tiny panel mount, push button actuator. Quick disconnect terminals also are available. **Circle 61 on Reader Service Card.**

Electronic Timers transistorized

THE A. W. HAYDON CO., Waterbury 20, Conn. A new line of electronic timers offer high temperature operation, high vibration, lightweight and very short time delays. A transistorized R-C time constant network is used to establish the time delay and eliminate all moving parts except the load switching relay. Two series are currently offered with time delays ranging from 50 millisec to 60 sec. The 31200 series, miniature style can be pro-



Leesona No. 108 Coil Winders wind transformer coils for the Sorensen Model MR36-30 Magnetic Ranger, a wide range regulated DC power supply, delivering 5-36 VDC at 0-30 amps, designed and manufactured by Sorensen & Co., Inc., South Norwalk, Connecticut.

High Accuracy...

that's why SORENSEN & CO. chose Leesona® No. 108 Coil Winders

Sorensen & Co., Inc. — leader in the field of regulated power supplies — designed the Sorensen Magnetic Ranger used in missile and aircraft test systems — *and it chose Leesona 108's to wind the transformer coils.*

At Sorensen, where accuracy, speed, and economical operation are always critical factors, this was not a radical decision. Leesona machines have been winding Sorensen's transformer coils for years — and doing a superior job all along.

Leesona No. 108 is a precision machine with controls that can be adjusted to *your* coil winding problems. Quick set-up, easy operation. Accommodates wire sizes from No. 20 to No. 42 and finer, winds up to 30 coils at a time. Reversing clutch increases accuracy, decreases wear.

Many More Special Features

Find out the facts and figures showing exactly how *you* can heighten your coil winding accuracy while cutting winding costs with a flexible Leesona No. 108 Hand Feed Coil Winder. Write for details on this and other coil winding machines.

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☐ Bulletin on the Leesona No. 108 Hand Feed Coil Winders.

☐ Condensed catalog of Leesona Winders.

Name..... *Title*.....

Company.....

City..... *Zone*..... *State*.....

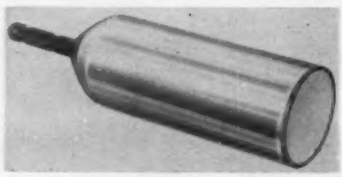
vided with contact arrangements up to 4 pdt. Cross section is 1 7/8 in. by 1 3/4 in. and basic length is 2 1/4 in. The 31300 series, subminiature style, can be supplied with contact arrangements up to dpdt. Cross section is 3/4 in. by 1 1/8 in. and basic length is 2 1/8 in. **Circle 62 on Reader Service Card.**

Motor Generator weights 20 oz

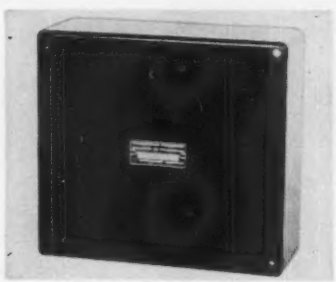
JOHN OSTER MFG. CO., Avionic Division, 1 Main St., Racine, Wis. Type 18-MTG-6302 servo motor tach exceeds BuOrd Mark 16 specs with operating temperature range from − 54 C to + 125 C and with starting voltage as low as 1 1/2 v. The unit consists of 115 v 400 cycle 2 phase size 18 servo motor with a precision size 15 tachometer integrally mounted on the motor shaft. The entire unit weighs 20 oz. **Circle 63 on Reader Service Card.**

C-R Tube five-in. unit

CBS-HYTRON, Parker St., Newburyport, Mass. Type 5BYP5 is a five-in. ultrahigh-resolution crt providing a minimum resolution of 6,000 tv lines throughout the entire field of scan. It achieves its resolution



principally by means of a 0.0007-in. electron beam with symmetrical clipped profile. A short persistence, actinic screen with P5 phosphors is used. Optically flat, non-browning glass is employed for the faceplate to provide a distortion-free screen. Accuracy of deflection linearity is inherently one percent and with circuit correction, 0.1 percent. **Circle 64 on Reader Service Card.**

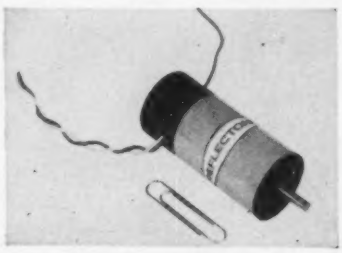


Magnetic Amplifier proportional type

MAGNETIC CONTROLS CO., 6405 Cambridge St., Minneapolis 16, Minn. A highly sensitive proportional magnetic amplifier provides reliable temperature control for industrial ovens and such devices as hermetic integrating gyroscopes. The PA4A-1 is capable of proportional control of up to 150 w output power with input power of a few millimicrowatts. Using a combination of proportional and integral control, an input signal of less than 1 μa will produce full power output. The unit is tubeless and encapsulated. It is designed for −67 to +200 F continuous operation. **Circle 65 on Reader Service Card.**

P-M Motors from 4 to 30 v d-c

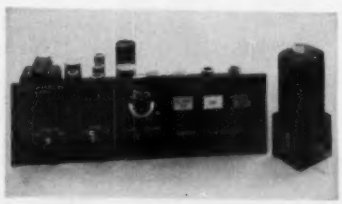
THE REFLECTONE CORP., Stamford, Conn., announces a new line of d-c permanent magnet motors. They have a wide variety of commercial and military applications. Assembly is compact, simple and rugged. The Indox I field structure



is totally enclosed within a steel shell, providing complete self-shielding, and the assembly is readily mounted or dismounted without affecting magnetic characteristics. The motor is available in sleeve bearing or ball bearing with a variety of shaft extensions or mounting arrangements. **Circle 66 on Reader Service Card.**

Positioning Servo accurate to 3 min

UNITED HYDRAULICS, INC., 110 Terrell Court, Dayton 7, Ohio. The amplifier and actuation illustrated are a complete system providing high accuracy settability. The 10 turn demand pot controls 160 deg of actuator motion to within 3 min. (0.05 percent). The actuator includes a strained gear loop to eliminate the error of output shaft backlash. The balanced d-c differential amplifier operates from 115 v 60 cps and also includes



the power supply for the actuator. Components are plug-in type. To indicate that the actuator has reached position after a new setting of the demand pot, an auxiliary relay is provided. The relay closes when position is reached. This circuit may be used in conjunction with a program interlock or for visual or audible indication. **Circle 67 on Reader Service Card.**

Resistor Networks tapped fixed type

THE DAVEN CO., Livingston, N. J., has developed improved models of their tapped fixed networks series 1030, 1031 and 1032. These units are designed to provide tamper-proof methods of adjusting or setting the gain by means of soldered connections. They are especially useful in accurately calibrating equipment in production and for recalibrating equipment in the field after the replacement of a major component. **Circle 68 on Reader Service Card.**

Counting Package multipurpose unit

VEEDER-ROOT INC., Hartford, Conn. Model N-1 Count-Pak utilizes a compact, glow-transfer, cold-cathode counting tube, and a high-speed magnetic counter, combined with a small, adaptable

ACEPOT®

Nonlinear ACEPOT shown actual size.

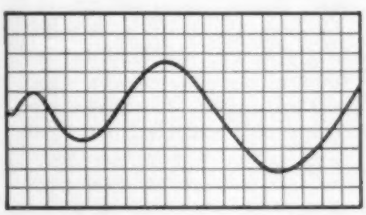
PRECISION, WIRE-WOUND

NONLINEAR POTENTIOMETERS

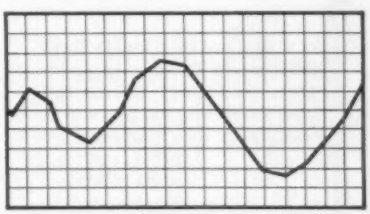
0.25% terminal conformity *without padding resistors*

A potentiometer without padding resistors produces a smooth output function curve as opposed to a stepped function curve when padding resistors are used. With the addition of padding resistors there is also a corresponding decrease in reliability and accuracy since each padding adds a pair of critical tap-offs to the delicate wire windings.

ACEPOT nonlinear potentiometers have terminal conformity to 0.25% without padding resistors. Desired output function is achieved by use of unique winding equipment of microscopic accuracy plus newly developed manufacturing techniques for precision, miniaturized parts. Dependability is guaranteed with ACE quality control. A tabulation of check points showing voltage ratio versus rotation is supplied for each unit.



ACEPOT WITHOUT PADDING RESISTORS achieves output function within 0.25% with *smooth* curve that follows application requirements exactly.



SAME FUNCTION WITH PADDING RESISTORS follows *stepped* curve which impairs accuracy and introduces "tap-offs" that decrease reliability.

To meet the exact requirements for your particular applications, ACEPOTS can be custom designed and mass produced with short lead time. ACEPOTS in AIA sizes are immediately available in sine, cosine, square law and logarithmic functions that meet applicable sections of MIL specs. Call, wire or teletype Dept. F at ACE ELECTRONICS ASSOCIATES, INC., 99 Dover Street, Somerville, Mass. SOmerset 6-5130. TWX SMVL 181.

ACEPOT® ACETRIM® ACESET® ACEOHM®

ACE ELECTRONICS ASSOCIATES, INC.

NOW...1 to 80 polaroid exposures in ONE loading with the newest BEATTIE OSCILLOTRON!

LABORATORY recording of oscilloscope traces is far more efficient with this new camera.

Key to the versatility of the new Beattie Oscillotron with a polaroid back is the feather-touch Multiple Exposure Positioning Bar. Now you can get one-to-one presentation or up to 10 exposures on a single frame—by a simple adjustment. Other features: f/1.9 lens, shutter speeds from 1 sec. to 1/100 sec., time, and bulb.

This new Oscillotron camera fits the same periscope to which all other Beattie Oscillotron cameras are attached.

Multiple Exposure Positioning Bar

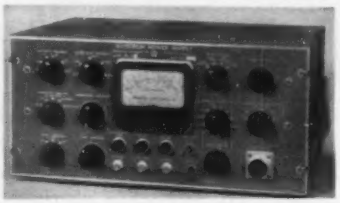
for more information write to

BEATTIE-COLEMAN inc.

1000 N. Olive St., Anaheim, California

CIRCLE 17 READERS SERVICE CARD

photo-head. The unit is designed to count accurately at speeds up to 30,000 counts per minute for more than one billion counts. It will reset at rated speeds without losing counts. The counting package uses transistors and printed circuits (no tubes or relays) which means low heat and simple wiring, both basic factors in long and uninterrupted operation. The counter can be used to measure accurate lengths, to count high-speed shaft revolutions, and to count a wide variety of objects. **Circle 69 on Reader Service Card.**

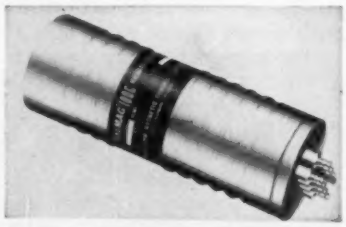


Power Supply klystron type

Browning Laboratories, Inc., 100 Union Ave., Laconia, N. H. The new TVN-15 klystron power supply gives wide range of voltages and currents for operating klystron tubes and circuits. Electrical features include: beam voltage, variable from 450 to 750 with regulation better than 1 percent; current, 100 ma; grid volts + 150 to − 200; reflector supply, r-f oscillator type continuously variable from 40 to 1,050 v. Square wave, saw tooth, sinewave, and external modulation are available. **Circle 70 on Reader Service Card.**

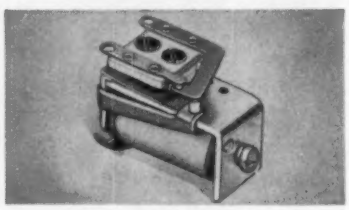
Retaining Rings size identified

Rotor Clip Co., 114 Allen Blvd., Farmingdale, L. I., N. Y., has available a complete series of size identified retaining rings for industry. Ring size is engraved on each piece, thus offering foolproof size identification and eliminating costly and time consuming mistakes. Every ring has a special tapered design for lower stress at the midsection. Rings are also available stacked on rods for automatic assembly operations. The company offers a free engineering service to assist manufacturers in adapting Rotor Clip fasteners to their product. **Circle 71 on Reader Service Card.**



Magnetic Amplifier ultrastable unit

Calmag Division, California Magnetic Control Corp., 11922 Valerio St., N. Hollywood, Calif. Model 100C3 magnetic d-c amplifier features power gain greater than 120,000. Input power of only ½ μw will drive power output to full linear scale. Input is isolated from output and is provided in two isolated sections which can be arranged for common mode rejection of over 100 db or used separately for summing etc. The device is supplied in voltage gains of 250, 500 and 1,000. Gain stability of ±¼ percent or better is achieved with variations in line voltage of ±10 percent and frequency of ±5 percent. The unit weighs 6.8 oz; measures 1½ in. in diameter by 4⅛ in. long. **Circle 72 on Reader Service Card.**



Subminiature Relay low capacitance

Magnecraft Electric Co., W. Grand Ave., Chicago 51, Ill. A new relay for switching radio fre-

quencies on applications such as antenna change-over on mobile radio is announced. A special contact spring construction is designed to provide the lowest possible capacitance between springs. Low loss ceramic is used for contact spring insulation. Operating voltages are 6 to 110 v d-c. It is available with spst or spdt contacts, rated 2 amperes at 24 v d-c or 115 v a-c noninductive load. Overall dimensions are 1⅛ in. long, 1 in. high, ⅛ in. wide. **Circle 73 on Reader Service Card.**

R-F Equipment for microwave use

Motorola Inc., 4501 W. Augusta Blvd., Chicago 51, Ill. The MR-20 microwave r-f equipment is designed for duplex, multichannel, point-to-point communications. With major power gain realized in the antenna system, the MR-20 can use low power reflex klystron tubes in the transmitter and receiver. Use of these long-life reflex klystrons permits generation and direct frequency modulation of the microwave carrier in one dependable tube, reducing the number of components needed and adding to the equipment's overall reliability. The waveguide of the MR-20 has been simplified so that additional r-f channels can be multiplexed to a common antenna. The new equipment is provided in the common

New!
MINIATURE TIMERS
of Field-Proved PERFORMANCE by HAYDON* at TORRINGTON

FOR 115 VOLT, 400 CYCLE OPERATION

First to develop a truly miniature elapsed time indicator, HAYDON at Torrington now offers this varied line of miniature, hermetically sealed, timing devices . . . all tested and proved in the field in missile guidance and jet aircraft applications.

Basis of all these miniature devices is the Haydon 400 cps Synchronous Timing Motor . . . the inherently accurate approach to instrumentation in military equipment. Sealed-in-steel case eliminates stray magnetic fields. Elapsed Time Indicators are available in the direct-reading type illustrated and also in dial type. Newest additions to the line are the miniature Time Delay Timer and the miniature Repeat Cycle Timer available with 1 to 4 switches. Weight is approx. 7 ounces.

OTHER HAYDON TIMERS FOR MILITARY APPLICATIONS . . . include: D-C Timing Motors for 6 to 32 volt operation, 60 Cycle A-C Motors in a very wide range of speeds, Heavy Duty 400 Cycle Timing Motors, and Elapsed Time Indicators for 60 cycle operation.

GET COMPLETE INFORMATION NOW . . .
Consult the Haydon Field Engineer in your area or, if you prefer, write to us direct, outlining your requirements. You'll find that Haydon has the experience, know-how and facilities to solve all your timing problems.

*TRADEMARK REG. U.S. PATENT OFFICE

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American Blower suggests:

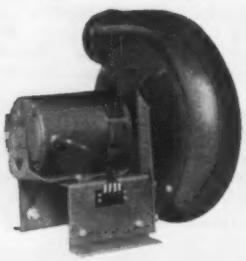
PACKAGED CURE FOR HEAT-CAUSED "BUGS"

Countless "bugs" in delicate electronic equipment result from deterioration of components from their own heat. Cure: Dependable cooling, provided by an American Blower packaged air-moving unit. Numerous sizes and designs to choose from—many can be modified as needed. Or, if necessary, we can start from scratch and design a fan or blower to fit your exact needs. For individual specification bulletins, write, detailing your requirements. American-Standard,* American Blower Division, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ont.

FOR COOLING ELECTRONIC EQUIPMENT IN AIRCRAFT

Small aluminum axial-flow fan. Capacity: 110 cfm @ 0.6" sp to 165 cfm, free delivery @ 7250 rpm. Write for Bulletin 3812.

FOR RADAR COOLING



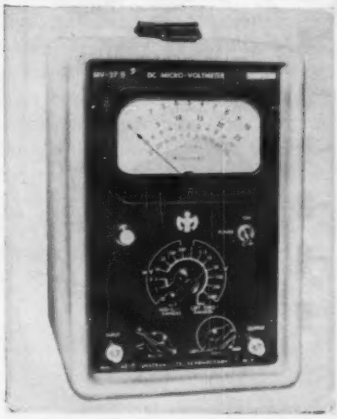
Aluminum pressure blower. Capacity: 984 cfm @ 1" sp to 536 cfm @ 7" sp @ 3450 rpm. Write for Bulletin 4512.

* American-Standard and Standard® are trademarks of American Radiator & Standard Sanitary Corporation.

American-Standard
AMERICAN BLOWER DIVISION

CIRCLE 19 READERS SERVICE CARD

carrier 5,925-6,425 mc band; the operational fixed 6,575-6,875 mc band and the government 7,125-7,650 mc band. **Circle 74 on Reader Service Card.**



D-C VTVM is polarized

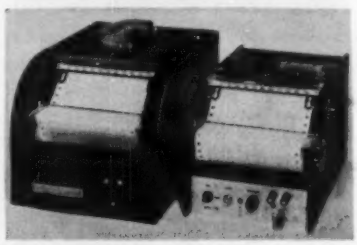
MILLIVAC INSTRUMENTS, P.O. Box 997, Schenectady, N. Y. The MV-27D d-c microvoltmeter has 250 μv full scale sensitivity, its highest range being 0.1 kv. On its three lowest ranges, 250 μv, 1 mv and 2.5 mv, it uses mid-zero scales to facilitate null-indicator operation in bridge circuits. All other ranges are left-zero for maximum scale length and highest reading accuracy and convenience. The instrument is housed in a modernized cabinet with recessed front panel, has a larger indicating meter and is polarized, thereby eliminating "needle fold-over" under negative overloads on the mid-zero ranges, as did occur in earlier models. **Circle 75 on Reader Service Card.**

Synchros stainless steel

INDUCTION MOTORS OF CALIFORNIA, 6058 Walker Ave., Maywood, Calif. A new series of synchros, resolvers and linear transformers for indication and control have been announced. The size 8 synchro illustrated is widely used to actuate a pointer to reproduce angular data at remote points, such as in trim flap and similar control surface applications. In addition to position indicating on valves, computer shafts and missile components, the units achieve extreme accuracy as sensing elements and in servo mechanisms. Operating temperatures are from −50 C to +125 C. **Circle 76 on Reader Service Card.**

Oscilloscope rack-mounted unit

ELECTRONIC TUBE CORP., 1200 E Mermaid Lane, Philadelphia 18, Pa. Identical horizontal and vertical amplifiers, plus a space-saving rectangular crt, highlight the K-11-R rack-mounted general purpose oscilloscope. The two amplifiers cover a bandwidth from d-c to 300 kc with sensitivity from 1 mv per cm to 150 v per cm. Phase shift is less than 3 percent, making the instrument particularly well suited for precise studies of phase relationships and servo mechanisms. **Circle 77 on Reader Service Card.**



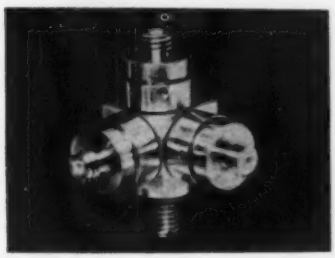
Pot-Recorder versatile, rugged

SAN JOSE SCIENTIFIC CO., 605 Sunol St., San Jose, Calif., offers the SR-100 rectilinear, null-balance potentiometer-recorder, with plug-in servo amplifier and horizontal platen writing surface. Recordings can be achieved of any phenomenon from which a d-c voltage or current is derived; such as variations in light intensity, speed, temperature, pressure/flow (with appropriate transducers). Compactness is achieved by mul-

tiple bank-mounting in relay racks and the servo amplifiers proper may be stacked as well. Jumper-cable serviceability is enabled by virtue of design. Instrument design of the pen-glide permits auxiliary "go, no-go" limits and inking references, permitting remote servo-control application. **Circle 78 on Reader Service Card.**

Ku-Band Window for waveguide use

BOMAC LABORATORIES, INC., Salem Road, Beverly, Mass., announces a new pressurizing window, the BL777. This K_u-band window has a maximum vswr of 1.12 over a frequency range of 12.4 to 18.0 kmc, and is for use in waveguide size RG91/U. The BL777 is designed for mounting between UG541/U choke flanges, can be pressurized to a maximum pressure differential of 30 psi, and will operate up to 100 kw maximum. **Circle 79 on Reader Service Card.**

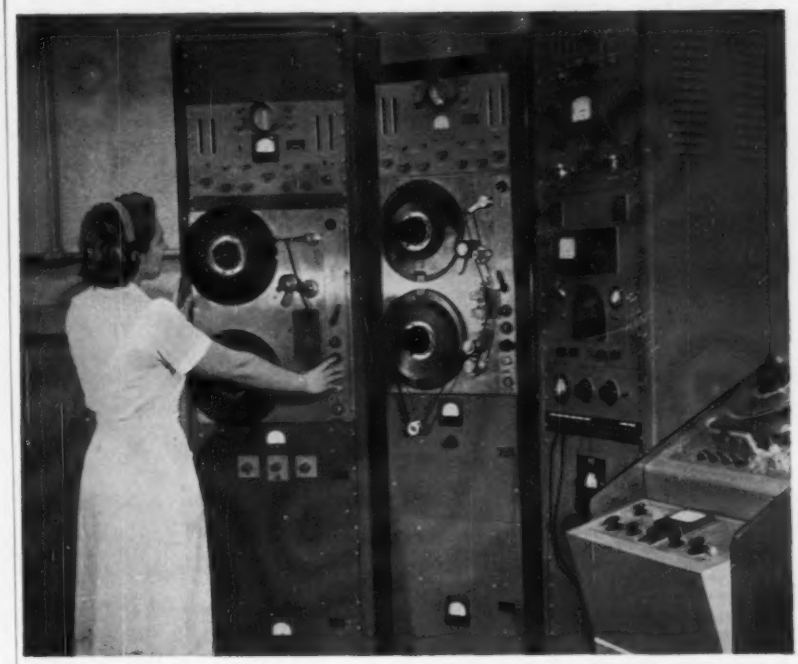


Accelerometers tri-axial

COLUMBIA RESEARCH LABORATORIES, MacDade Blvd. & Bullens Lane, Woodlyn, Pa. A line of tri-axial accelerometers has been designed

The world's toughest referee

...a count of one and the tape is OUT!



The machine above is a unique testing instrument, designed by Audio Devices engineers and installed at the Audiotape plant in Glenbrook, Conn. This Automatic Defect Counter records and plays back every inch of the EP Audiotape under test.

Type EP is the extra precision magnetic recording tape for applications in computing, automation, telemetering and seismography. If the tape fails to record a single test pulse out of the millions put on a single reel, the entire reel is rejected. There are no ifs, ands or buts.

This is one of many special quality-control operations to which type EP Audiotape is subjected. The extra attention begins at the raw material stage where the master rolls of base materials are critically examined for uniformity of gauge, freedom from stretch, and cleanliness. The oxide and binder components are selected for fineness of dispersion and magnetic properties—then combined and fed through a micronic filter and metered on the selected foil in Audio's special dust-free precision coating machines. The coated master rolls are then selected for freedom from imperfections and proceed through the slitting operation. Each ribbon is wiped after slitting to remove all traces of dust, run through the defect counter, rejects discarded, and the defect-free tape packed in hermetically sealed metal cans or plastic cases.

The defect counter does its job so well that type EP Audiotape is *guaranteed* to be defect-free! For more information write for free Bulletin T112A. Write Dept. TE. Audio Devices, Inc., 444 Madison Avenue, New York 22, N. Y.

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AUDIO DEVICES, INC.,
444 Madison Ave., N. Y. 22, N. Y.

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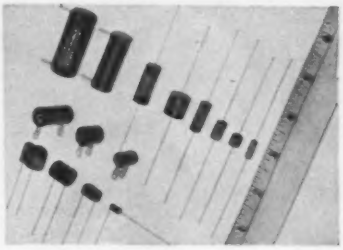
to measure shock and vibration in three mutually perpendicular directions simultaneously. The units reduce installation time and minimize space requirements in tests where three accelerometers were previously needed. Sensitivities up to 27 mv/g are available to provide an acceleration response from 0.03 to 40,000 g. Natural frequencies range from 20 to 35 kc for frequency coverage from 1 cps to 12 kc. Upper temperature limits of 200 F or 540 F are optional. **Circle 80 on Reader Service Card.**

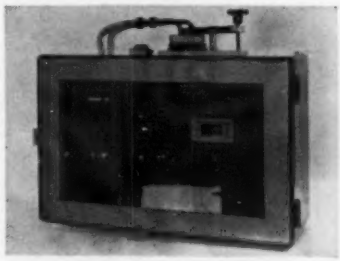


Wirewound Resistors fully encapsulated

Ultronix, Inc., 116 S. Bayshore Blvd., San Mateo, Calif., has available a line of fully encapsulated precision wire wound resistors. Offered in a wide variety of types and sizes from 10 milliohms to 20 megohms, they can be supplied to tolerances as close as 0.01 percent. Standard temperature coefficient is 15 parts per million per deg C. **Circle 81 on Reader Service Card.**

Power Supply strain gage type

Western Gear Corp., Box 182, Lynwood, Calif., announces a 72 channel strain gage power supply for use in a rocket engine test stand. Resistance to ground is more than 10,000 megohms, and internal noise level of the unit with respect to ground is less than 5 μv peak to peak. Nominal output of 10 v is adjustable by means of a 10 turn pot. Designed to operate in a temperature range of 0-45 C, output voltage is constant under this temperature, variation $\pm$ 0.025 percent. **Circle 82 on Reader Service Card.**



Photometer controls filtration

Renupp Co., 3457 Greenfield Ave., Los Angeles 34, Calif. The Sigrist photometer, by reason of its automatic compensation system, makes possible the continuous control of filtration processes by the constant measurement of the turbidity of the filtrate. The instrument is supplied with a control switch which operates signal devices when the adjusted turbidity value is surpassed, or regulating devices if desired. **Circle 83 on Reader Service Card.**

Linear Motion Pot extremely small

Bourns Laboratories, P.O. Box 2112, Riverside, Calif., announces model 141 Linipot which has a body length of 1¼ in. and a cross section only ¼ in. by ⅜ in. It gives a precise electrical indication of travel position and operates with a high level a-c or d-c output, requiring no amplification. It is designed primarily for use in recording, control and telemetering

circuits. The wirewound unit can be provided with printed circuit pins, solder lugs or flexible lead wires. **Circle 84 on Reader Service Card.**

Digital Voltmeter portable unit

KinTel, a division of Cohu Electronics, Inc., 5725 Kearny Villa Rd., San Diego 12, Calif. Model 801 is an all electronic portable digital voltmeter that measures d-c voltages from 0.001 to 999.0 v with 0.1 percent accuracy. It presents the measured voltage on a sharp, clear in-line digital readout in only 0.1 sec. It is designed for rugged applications such as continuous production line testing and calibration. Price is $960. **Circle 85 on Reader Service Card.**

Miniature Tubes multipurpose

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y., has announced two multipurpose miniature tubes for series string operation in tv receivers. Type 5CR8, a 9-pin triode-pentode, features a suppressor grid and internal shield tied to the triode cathode, permitting partially unbypassed cathode bias on the pentode to minimize i-f detuning with agc changes. Type 6BR8A is a 9-pin miniature medium-mu triode and sharp cut-off pentode. **Circle 86 on Reader Service Card.**

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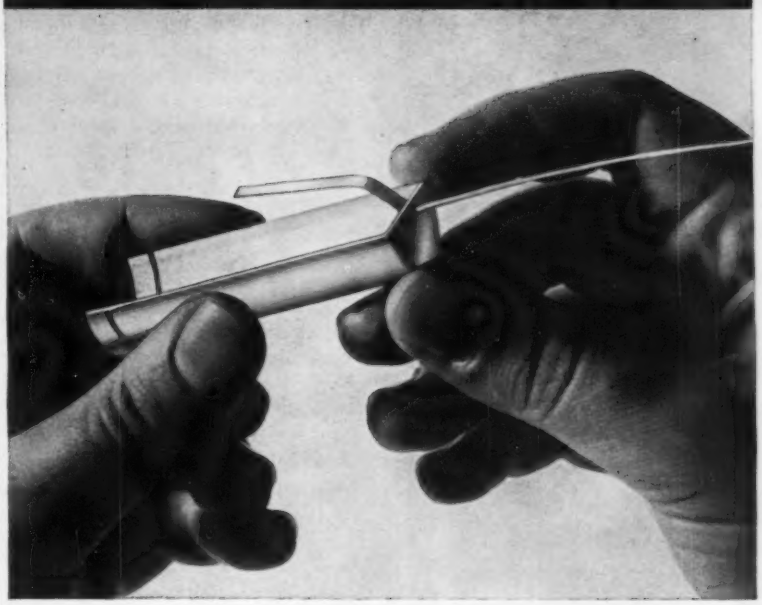
OF YOUR SMALL METAL PARTS JOINING PROBLEMS



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PROBLEM: join an aluminum tab to the inside, and a tinned copper lead to the outside of this aluminum capacitor can. **SOLUTION:** A **Raytheon Welding Analyst** suggested making **both welds at once;** helped select the proper welding equipment and set-up for the job. **RESULT:** welding time cut in half.

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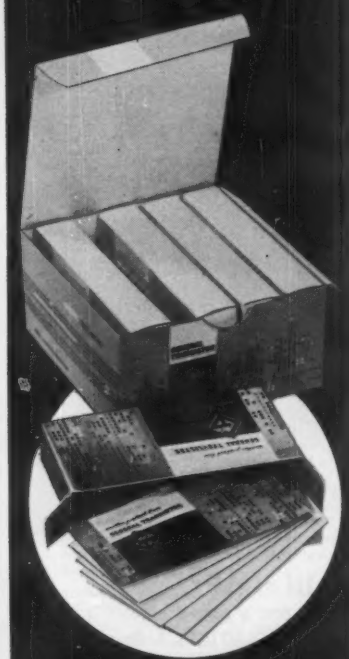

General Transistor is now packaging their Germanium Gold Bonded Diodes in individually sealed plastic envelopes. There are ten envelopes in each box and five boxes per master container.

The purpose of this new package is to offer OEM manufacturers "factory fresh" diodes, individually packed, for small quantity purchases.

General Transistor Authorized Distributors will carry this package you'll receive fast deliveries of top performing diodes . . . every time.

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CIRCLE 23 READERS SERVICE CARD

Literature of the Week

MATERIALS

Silicone Insulating Materials. Dow Corning Corp., Midland, Mich. Bulletin 10-106 is entitled "Specify Silicone Insulated Motors and Transformers and Save." It details the growing use of silicone insulation in original equipment. **Circle 87 on Reader Service Card.**

COMPONENTS

Delay Lines Catalog. Control Electronics Co., Inc., 1925 New York Ave., Huntington Sta., L. I., N. Y. A new catalog covers custom built and standard distributed constant delay lines. It lists over a dozen of the custom built units with impedances ranging from 500 to 10,000 ohms, and delays from 0.1 to 36 μsec. It covers over 90 distributed constant delay lines with standard impedances and delays. **Circle 88 on Reader Service Card.**

Soldering Tips. Hexacon Electric Co., 130 W. Clay Ave., Roselle Park, N. J. Catalog 600 lists the Hexclad and Xtradur lines of long-life clad soldering tips, both plug and screw tip types, for all makes. **Circle 89 on Reader Service Card.**

Tube Shields. International Electronic Research Corp., 145 W. Magnolia Blvd., Burbank, Calif. A new 28-page edition of "Heat-dissipating Electron Tube Shields and Their Relation to Tube Life and Equipment Reliability" is available. **Circle 90 on Reader Service Card.**

EQUIPMENT

Current Division Test Set. Briggs Associates Inc., 10 DeKalb St., Norristown, Pa. A single-sheet bulletin illustrates and describes a current division test set for measuring tube performance capabilities under class C operating conditions. The sets described are in use by tube manufacturers performing current division and pulse emission tests. **Circle 91 on Reader Service Card.**

Instruments. Kay Electric Co., Maple Ave., Pine Brook, N. J. The 1958-59 catalog contains 52 pages illustrating and describing ten broad categories of instruments and a series of specialized custombuilt equipment. **Circle 92 on Reader Service Card.**

Large Antennas. D. S. Kennedy & Co., Cohasset, Mass. Large antennas for communications, radar, tracking and radio astronomy are featured in a new short form catalog. **Circle 93 on Reader Service Card.**

Small Armature Winder. Geo. Stevens Mfg. Co., Inc., Pulaski Road at Peterson, Chicago 30, Ill. A new catalog page pictures and completely describes model 46-MCA high speed small armature winder with time-saving self-resetting automatic counter. **Circle 94 on Reader Service Card.**

FACILITIES

Facilities Brochure. The W. L. Maxson Corp., 475 Tenth Ave., New York 18, N. Y. A recent leaflet covers the company's research, development and production achievements for military and industrial needs. **Circle 95 on Reader Service Card.**

Fluid Flow Measurement. Waugh Engineering Co., 7842 Burnet Ave., Van Nuys, Calif., manufacturer of fluid flow measuring instruments, has prepared a brochure describing its engineering, manufacturing and testing facilities, together with brief biographical sketches of its key personnel. **Circle 96 on Reader Service Card.**

CIRCLE 24 READERS SERVICE CARD→

A COMPLETELY NEW *Concept* IN

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These positive hermetically sealed units are designed for printed circuit boards and subminiature assemblies for airborne and missile applications.

The quality of materials and production superiority of these resistors is the same that has made General Transistor the Fastest Growing Name in Transistors.

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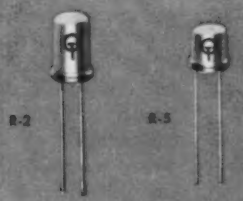
SPECIFICATIONS

	Style R-2	Style R-5
Resistance Range	0.1Ω to 750KΩ	0.1Ω to 750KΩ
Resistance Tolerance	±0.05% min. at 25°C	±0.05% min. at 25°C
Power Rating	¼ watt continuous in free air (increased dissipation possible with heat sink)	½ watt continuous in free air (increased dissipation possible with heat sink)
Temperature Range	−65°C to +125°C	−65°C to +125°C
Maximum Operating Voltage	250V, DC	500V, DC
Temperature Coefficient of Resistance	±20 parts per million/°C	±20 parts per million/°C
Dielectric Strength	500V rms, winding to case	1000V rms, winding to case

Construction — Terminations: — Welded



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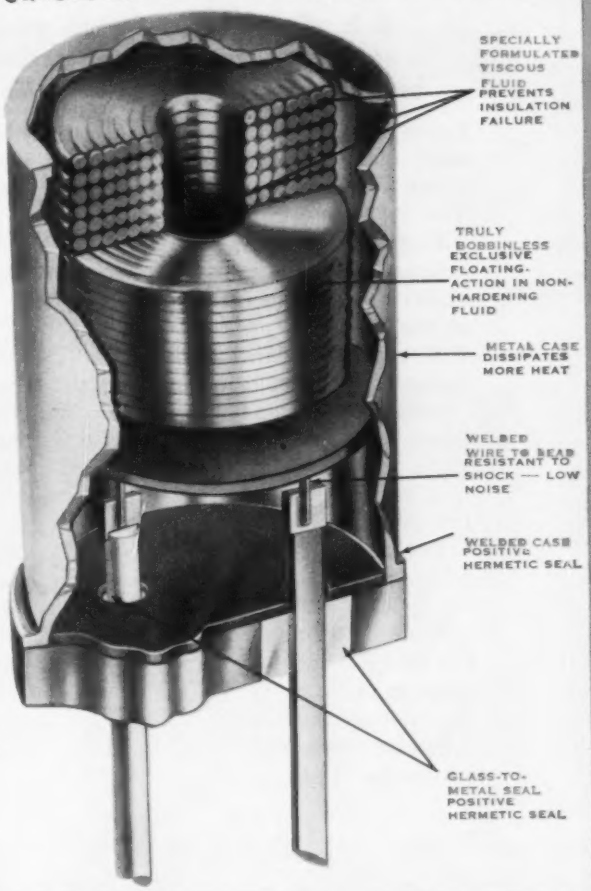
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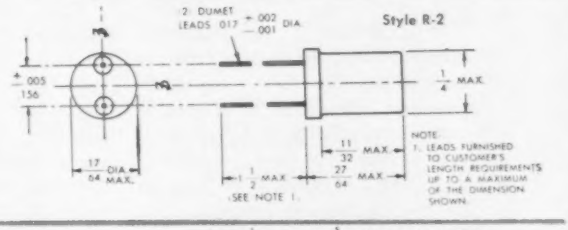
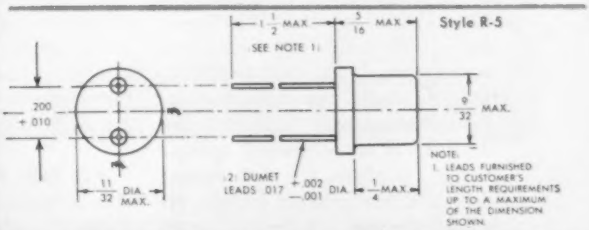
GLASS-TO-METAL SEAL POSITIVE HERMETIC SEAL


Style R-2
2 DUMET LEADS .017 +.002 −.001 DIA.
.005 .156
1/4 MAX.
17/64 DIA. MAX.
11/32 MAX.
1/2 MAX. (SEE NOTE 1)
27/64 MAX.
NOTE:
1. LEADS FURNISHED TO CUSTOMER'S LENGTH REQUIREMENTS UP TO A MAXIMUM OF THE DIMENSION SHOWN.


Style R-5
1 1/2 MAX. (SEE NOTE 1)
5/16 MAX.
.200 +.010
9/32 MAX.
11/32 DIA. MAX.
2 DUMET LEADS .017 +.002 −.001 DIA.
1/4 MAX.
NOTE:
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FOREIGN BUSINESS

Money Issue in Latin America

U. S. electronics exporters study area closely as purchases decline because of lower dollar reserves

LATIN AMERICA, fastest growing export market for many electronics firms last year, today is under closer scrutiny as a trading area in the wake of Vice President Richard M. Nixon's tour.

Electronics exporters, with their eyes on a vast potential market, may have to reckon with the possibility that the foreign exchange plight of many of the states will prevent sizable imports. Total U.S. exports to Latin America in 1957 exceeded imports by $905 million, four times the 1956 gap.

Radio and tv sets, two items easily identified in export trade statistics as electronic, so far this year are showing declines. Latest available Department of Commerce figures on radio set exports, for January and February, indicate:

Twenty Latin American republics, with only 21.4 million radio sets for about 175 million people, are buying U.S. radios at a rate that would mean a $580,000 drop on an annual basis from the $1,991,654 for 1957. Tv set exports will fall $1.6 million short of last year's $13,954,359 total if the rate of buying is not increased.

Best customers for radio and tv sets are Cuba and Venezuela. They bought $11,155,439 worth of tv sets and $1,270,699 worth of home radios between them in 1957. So far this year, Cuba is buying more tv sets, fewer radios while Venezuela is doing the reverse.

It is in the other republics where the principal economic danger signs exist. Meanwhile, European interests, competing hard with U.S. firms, are not losing sleep over loss of American prestige or unfavorable Latin American trade balances with the U.S. Many European firms have been providing long terms of payment and cut prices (ELECTRONICS, Special Market Report, p 28, Jan. 24).

Uruguay, third wealthiest republic in terms of per capita income, bought only $8,287 worth of radio sets and $152,119 worth of tv sets last year as her acute foreign exchange shortage developed. In the first two months of 1958 her imports of U.S. radio sets were down to zero, tv sets to $518.

Brazil and Argentina, tops in national income and in the number of home radio sets already in use, entered 1958 with sharply reduced dollar reserves. They slashed U.S. radio and tv set imports drastically. Peru upped its tv purchases to $22,802 for the two months compared to a 1957 all-year total of $30,328, but her radio set purchases plunged from a $100,000 annual rate to $4,403 for the two-month period, a rate about one-fourth of last year's total.

DEVELOPMENTS ABROAD

• **In Britain** a new transistor company has been formed by three large firms that have carried out separate transistor development without getting into full production. New company, Associated Transistors, is owned by English Electric, Automatic Telephone and Electric, and Ericsson Telephones. Firm will make switching transistors to suit the telecommunications needs of the sponsor firms, but will also produce semiconductor devices "of more general application." Mullard Co. last month opened a new product division for semiconductors, including transistors.

• **In West Germany** Siemens & Halske engineers are using an ultrasonic technique to detect imperfections in fine gage wire used in light bulbs and vacuum tubes. Wire is drawn over two guides, in one of which a vibration is set up by a quartz crystal. Second guide picks up pulses sent along the wire and sends them to a detector screen. There they appear as weak images if reduced in strength by flaws in the wire. Drive motor shuts down automatically and an audible warning is given.

• **In Italy** Radio Television Italiana announces that its Milan and Turin tv centers will be enlarged and new centers built at Bolzano, Naples and Bari. Tv subscriber's fee is slated to drop 12 percent next year to $22.40 a year.

EXPORTS and IMPORTS

In Paris the "First International Exhibition of Electronic Components" has been organized by the National Federation of Electronic Industries of France. It is scheduled for June 20-26 at the Parc des Expositions, Porte de Versailles. Components will include ampli-

In Brazil a new $1 million plant was opened last month to meet the need for basic magnetic materials in the developing electronic industries of Latin America. Firm, known as Eriesz S. A. Productos Magneticos e Metalurgicos, is owned jointly by W. R. Grace & Co. and Eriesz S. A. of Erie, Pa., and Panama City, Panama.

Britain's English Electric Co. has announced an agreement with

Minneapolis-Honeywell Regulator and the latter's British subsidiary, Honeywell-Brown, which gives English Electric design and production rights to Minneapolis gyros.

Venezuela's Compania Shell de Venezuela has ordered $4.5 million worth of pipeline switching and control gear from British firms for its Lake Maracaibo terminal project. An order worth more than $1.4 million went to South Wales Switchgear Co. Other contracts went to Reyrolle and Co., British Insulated Callenders Construction, English Electric, British Thomson-Houston, C. A. Parsons and Co. and Crumpton Parkinson Ltd.

British firms Ekco Electronics Ltd. and George Kent Ltd. recently announced a joint arrangement to cooperate in the nuclear instrumentation field. Kent is slated to provide physical instrumentation and recorders for reactors, heat exchangers and turbines; Ekco will supply nucleonic controls and health monitoring systems.

West German tv trade sources expect to boost set exports this year by 20 percent over the 180,000 units sold abroad last year. The industry feels confident it will sell all 1.25 million sets it plans to produce in 1958. Production last year was 808,000 sets valued at $113 million. Radio set production is expected to sag by 500,000 units from its 3.85 million set mark last year when 1.5 million units were exported, 193,000 to the U. S.

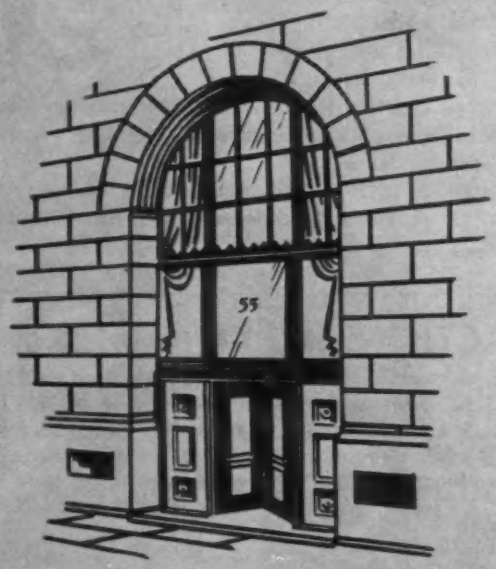
Dutch firm Van der Heem NV will manufacture jukeboxes for the Swiss sales office of Automatic Musical Instruments, Inc., of Grand Rapids, Mich., under a new agreement.

In Australia it is understood that NBC International is behind at least one current application for a tv station. Other U. S. interests are also believed to be backing applicants for licenses.

Jordan has just ordered a 100-kw medium-wave transmitter from Marconi for a station scheduled to start broadcasting in 1959.

Our service is tailored to provide all the working capital any qualified client needs, without increased borrowing, diluting profits or interfering with management.

Information available for any manufacturer or distributor with $500,000 or more annual sales.



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Live Tv Uses Vidicon Chains

Growing number of stations are saving money on live tv programming as vidicon gains acceptance

VIDICON CAMERA CHAINS for live tv shows are seeing increased use as cost conscious broadcasters look for ways to reduce expenditures.

A number of western broadcasters in moderate sized stations have begun using vidicon equipment. A look at cost gives an indication why. A vidicon pickup camera with viewfinder costs only approximately $2,000.

A complete vidicon chain consisting of camera, camera control, picture monitor power supply and accessories costs about $8,800.

The vidicon tube costs about $500. One usually lasts more than 4,000 hours.

A further consideration for moderate sized broadcast studios is the small amount of space occupied by vidicon camera chains.

Big-city stations in high competition areas say they do not yet plan to use vidicon equipment for live pickup. In major studios, vidicons are used with film.

Some engineers say vidicon tubes need too much light. A new vidicon tube, however, operates with light intensity as low as one foot-candle of highlight resolution on its face plate. The tube has a resolution of about 600 lines. A specially designed deflecting yoke, longer than older vidicon types, improves the tube's light sensitivity.

One station engineer says requirements for color programming have done much to improve lighting in many studios. In such locations, new vidicon equipment is said to operate well.

Some recently developed vidicon chains have automatic gain control circuits to match changing light levels. They also have clipping circuits in the amplifier systems which provide aperture corrections.

Vidicon tube makers point out their tubes now have less "smear" than older types, do not burn in images when focused in one spot.

A major manufacturer says about 70 percent of recent vidicon tube sales have been to stations which intend to use them for live pickup.

FCC ACTIONS

• **Announces** amendment of Canada-USA tv agreement to now assign channel 8 to Oliver, Brit. Col., and Cornwall, Ont.; channel 13 to Edmunston, N. B., Pembroke, Ont., La Sarre and Three Rivers, Que.

• **Cites** imposition of a $600 fine for violation of required radio protection rules by owner of a Florida fishing craft. Rules require that vessels transporting more than six persons carry radio-telephones.

• **Directs** preparation of documents looking towards grant of new channel 5 station for Texas Technological College in Lubbock, Tex.

• **Waives** frequency provisions in maritime rules to grant special temporary authority for Loraïn Radio Corp., Lorain, Ohio, to conduct communication in Great Lakes testing of facsimile area.

• **Amends** amateur rules for operations away from authorized transmitter locations effective June 24. Rules will then require only one notice when move in operations does not exceed one year. Licensee must give an address where he may be readily reached, or license number of his vehicle if ham rig is used as a mobile station.

• **Extends** time for shipboard radio transmitters to comply to type acceptance requirements and spurious emission limitations for frequency assignments below 30 mc. Owners of seagoing equipment have until January 1, 1959.

• **Grants** application of N. Y. State Power Authority for temporary renewal of authorization for one base station, 12 mobile units to continue coordination of activities with Canadian officials for work on St. Lawrence River development.

STATION MOVES and PLANS

WAHL, Hastings, Mich., files for c-p to change from using directional antenna to nondirectional.

WARU, Peru, Ind., requests transfer of controls from W. Hansen to Stark Broadcasting Corp.

WFVG, Fuquay Springs, N. C., asks for c-p to increase power from one kw to five kw, install new transmitter.

WVIM, Vicksburg, Miss., files for renewal of broadcast license.

WBBQ-FM, Augusta, Ga., requests assignment of license and c-p to Musicast of the South, Inc.

WBOS, Brookline, Mass., seeks c-p change to allow extension of completion date.

KXJK, Forrest City, Ark., asks for allocation of channel 8 to Forrest

City by reassignment from Jonesboro, Ark.

WGUY, Brewer, Me., seeks change in c-p to go to daytime operation, delete request for change in studio and transmitter location.

WLAU, Laurel, Miss., files for license to change frequency, hours of operation, increase power and change location.

WKPA, New Kensington, Pa., asks for license to cover c-p which authorizes installation of old main transmitter as auxiliary.

WFLN, Philadelphia, seeks modification of c-p to change type of transmitter, make changes in antenna system by adding third tower.

WDSG, Dyersburg, Tenn., seeks authorization to move transmitter 300 ft from present site, operate it by remote control from studio.

WSSV, Petersburg, Va., files for voluntary assignment of license to Petersburg Broadcasting Co., Inc.

KAFE (f-m), Oakland, Calif., asks for c-p change to allow change in location, increase in antenna height from 650 to 1082.25 ft.

WMDE, Greensboro, S. C., requests permission to establish subsidiary communication service to be operated on subchannels of 41 and 67 kc.

WRFK, Richmond, Va., Union Theological Seminary, asks for c-p to increase power from 0.01488 to 3.6334 kw, decrease antenna height from 124 to 111 ft.

WALB, Albany, Ga., files for c-p to change location, change erp from 91.2 kw visual-45.7 kw aural, to 277 kw visual-138.5 kw aural, change antenna height.

KXLU, Los Angeles, Calif., Loyola University, seeks permission to change frequency from channel 204 to channel 206, increase erp from 10 watts to 0.828 kw, change transmitter type.

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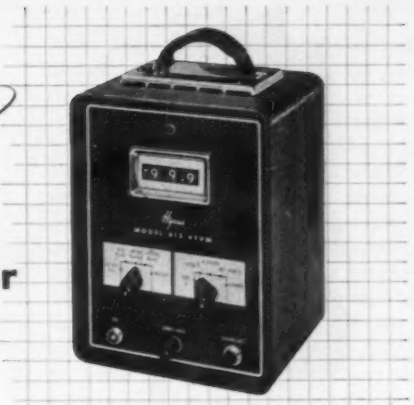

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THE MAN WE MEAN IS A COMPOSITE of the editorial staff of this magazine. For, obviously, no one individual could ever accomplish such a vast business news job. It's the result of many qualified men of diversified and specialized talents.

AND, THERE'S ANOTHER SIDE TO THIS "COMPOSITE MAN," another complete news service which complements the editorial section of this magazine — the advertising pages. It's been said that in a business publication the editorial pages tell "how they do it" — "they" being all the industry's front line of innovators and improvers—and the advertising pages tell "with what." Each issue unfolds an industrial exposition before you — giving a ready panorama of up-to-date tools, materials, equipment.

SUCH A "MAN" IS ON YOUR PAYROLL. Be sure to "listen" regularly and carefully to the practical business information he gathers.

McGRAW-HILL PUBLICATIONS

AIL, Cutler-Hammer Merge

CUTLER-HAMMER stockholders in Milwaukee recently gave the final okay to plans for the acquisition of Airborne Instruments Laboratory of Mineola, N. Y., through stock exchange and merger.

Twelve-year-old Airborne, with its roots in R&D, specializes in development of advanced electronic systems and depends on the military for much of its business. Sixty-six-year-old Cutler-Hammer manufactures electrical controls and switches, and has been established for many years in industrial and commercial markets.

Last year AIL, with a net worth of $2.4 million, garnered sales of $12.3 million. C-H, which has a net worth of $40 million, amassed a $75 million sales total. In the past five years sales of the Mineola firm climbed 170 percent, while sales of the Milwaukee firm increased 20 percent.

Behind AIL's decision to merge with Cutler-Hammer are two problems it shares with many other small and moderate-size electronics firms.

One is how to win prime contracts in today's military procurement market where the weapons system concept is in ascendancy and the trend is toward jumbo-size prime contracts. With most electronics contracts in advanced fields in excess of $40 million, smaller contractors find themselves being squeezed into the subcontractor's role.

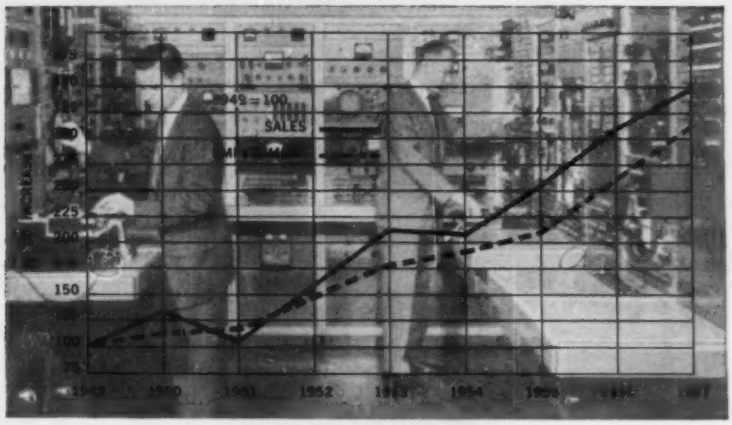
"The real barb in accepting this role is not the question of smaller earnings, but how to hold on to engineers," says Hector Skifter (picture, left), president of Airborne Instruments Laboratory.

Second problem faced by the Mineola firm was how to make a real dent in rapidly growing industrial electronics. The company says past efforts were slowed by lack of an industrial marketing organization, an established industrial reputation and the right production facilities, areas in which Cutler-Hammer has strength.

Philip Ryan (right), president of Cutler-Hammer, told ELECTRONICS the new Airborne Division will team with the present C-H organization in building an electronic bundling and wrapping system for the newspaper publishing industry. AIL will handle the electronic development work. C-H will tackle production and marketing problems.

Acoustica Forms New Division

IN Mineola, N. Y., Acoustica Associates, Inc., has formed an electronics manufacturing division with a newly-acquired 10,000 sq ft plant. The new division is equipped with necessary machinery and engineering personnel to accept prime and



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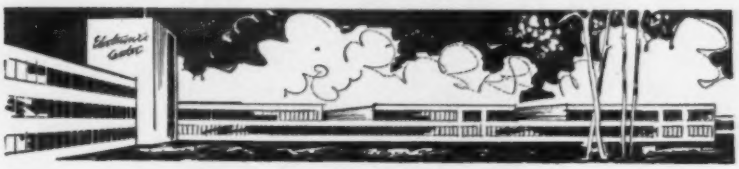

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subcontracts for simulator equipment, computers, amplifiers, power supplies, telemetering equipment, as well as its regular ultrasonic equipment.

The new facility brings Acoustica's total plants to six, located in Mineola and Glenwood Landing, L. I., N. Y., and Culver City, Calif., with a total production area of 45,000 sq ft. At present, Acoustica employs 180 people, including 65 engineers.

Plant Briefs

Yuba Consolidated Industries, Inc., has moved further into the electronics and missile fields by purchasing the **Dalmotor Co.,** Santa Clara, Calif. The new facility will be known as the Dalmotor Division.

Hubbard Potentiometers, Inc., Pomona, Calif., will henceforth do business under the name of **Hub-Pot, Inc.**

News of Reps

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Ralph F. Roussey Associates, Inc., is their rep in the midwest, including Illinois, Indiana, Iowa, Michigan, Ohio and Wisconsin, and in Pa. the counties of McKean, Cameron, Clearfield, Blair and Bedford.

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One windy Tuesday in Rome during the reign of the infamous Nero, a new mobile radar unit, on its way for delivery to the emperor's legions outside the city, suddenly caught fire. A tube blew, the sparks flew, the horses bolted, and soon all Rome was ablaze.*

Nero was furious. He had the members of the ill fated crew brought before him. "I'll make the punishment fit the crime!" he roared. While he thought about it, he picked up his violin and began to play. Since he was the vilest of violinists, the feelings of his listeners may better be imagined than described. He scraped his way through 'Keep the Rome Fires Burning' and 'Smoke Gets in Your Eyes.' At last he paused, confronting his trembling listeners.

"I'm going to have you all boiled in oil!" he boomed.

"THANK GOODNESS!" one of the doomed wretches exclaimed fervently as they were being led away. "For a minute I thought he was going to play 'Smoke Gets in Your Eyes' again!"

The obvious moral: *It doesn't pay to go horsing around with inferior tubes.*

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The outstanding features of the improved RCA-6AU4-GTA make it a highly dependable tube in horizontal-deflection circuits of TV receivers. A Preferred Tube Type, the 6AU4-GTA exhibits an unusual ability to resist plate-to-cathode arcing and internal breakdowns. This ability is derived largely from its cooler operation and improved construction.

Better heat dissipation is achieved with an increased bulb area, new plate shape, an improved "getter" design and the use of special "clad" plate material. Excellent uniformity and adherence of the cathode coating plus a cooler operating heater provide a more uniform cathode temperature.

Borderline tubes are eliminated by means of emission tests at extremely low heater voltage. Continuous monitoring through the use of cycled operational life tests plus cathode coating adherence tests provide further performance checks. The result is a tube you can rely on!

The RCA-6AU4-GTA is just one of the 62 Preferred Tube Types...selected to meet most of your TV, AM and FM receiver requirements. Like the 6AU4-GTA, each Preferred Tube Type is noted for its quality, economy and popularity.

Ask your RCA Representative for the current list of proved-in-service Preferred Tube Types. Or, write RCA Commercial Engineering, Section F-19-Q-2, Harrison, New Jersey.

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